

THE PREVALENCE OF PLAYING-RELATED INJURIES IN COLLEGIATE VIOLINISTS
AND THE PHYSICAL, EMOTIONAL, AND MENTAL EFFECTS OF ELDOA

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ABSTRACT

This exploratory study was designed to investigate the effects of ELDOA (Etirements Longitudinaux avec Decoaptation Osteo-Articulaire), an exercise series designed by osteopath Guy Voyer, on the perceived pain of collegiate violinists. The researcher created a pre-survey and a post-survey based off of previous surveys constructed by Kuorinka, B et al. (1987); Abréu-Ramos and Micheo (2007); Britsch (2005); Cooper, Hamann and Frost (2012); Fishbein, Middlestadt, Ottati, Straus, and Ellis (1988); Gupitill and Zaza (2010); Russell (2006); Rardin (2007); Russell and Bendetto (2014); and Kreutz, Ginsborg, and Williamon (2009).

Sixteen graduate and undergraduate students ranging from ages 18 to 23 participated in the study during the spring semester of the 2014-2015 academic school year. After completing the pre-survey participants were required to attend at least eight ELDOA classes which are funded by Project Jumpstart at Indiana University's the Jacobs School of Music. Once a minimum of eight classes were complete the participants filled out a post-survey.

The pre- and post-survey analysis identified that pain was most prevalent in the upper left side of the body. Students were affected not only physically but emotionally and mentally. Themes that emerged included increased flexibility, increased range of motion, lessened anxiety, and release of physical tension.

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CHAPTER I:

Statement of the Problem

Rationale

Musicians are prone to injuries due to the repetitive movements and physical demands that playing an instrument requires. The continuous physical actions put stress on certain ligaments, tendons, muscles, and fascia leading to (but not limited to) pain, tingling sensations, numbness, and eventually immobility. Often, due to their demanding environments, musicians continue to perform through pain and injury. Tension, pain, and injuries must not be ignored and can be prevented. To help prevent injury, musicians should educate themselves on ways to stretch and strengthen their bodies in order to maintain mobility, strength, and flexibility. Additionally, if music educators are aware of possible injury factors and prevention methods, they can teach their students about body awareness in relation to the instrument to prevent injuries. If musicians of all ages were educated in the field of injury prevention, the prevalence of injuries could potentially decrease.

Before the 1980's, limited research on the prevalence of injuries for student and professional musicians existed. Today researchers have begun to uncover just how important music medicine is to the health and performing longevity of musicians, but evidence prior to the 1980's is quite limited and difficult to find. Performing arts and medicine were separate research fields until 1987 when Alice Brandfonbrener began the first clinical and medical journal relating to the performing arts: The *Medical Problems of Performing Artists* journal (MPPA). According to the website, the MPPA is "devoted to the etiology, diagnosis, and treatment of medical and psychological disorders related to the performing arts" ("Medical Problems of Performing Artists," 2015). The MPPA forms the main research compilation of medical problems associated

with musicians and dancers. It is the official research journal publication for the *Performing Arts Medical Association*, *Dutch Performing Arts Medicine Association*, and *Australian Society for Performing Arts Healthcare*, and its editorial board consists of representatives from these organizations. In addition to the research journal, Palac (2008; 2012) acknowledges that MPPA was the first organization to hold a conference on musician injuries. The conference organized arts medicine into four categories of research: musculoskeletal, psychological, hearing, and vocal, which changed the future of research regarding musician health. MPPA contains a plethora of research on the prevalence of injury for musicians, much of which informs this thesis, but lacks research with specific holistic alternatives to prevent and rehabilitate musician injuries.

This thesis will draw from the existing research in the MPPA and investigate the potential of a holistic exercise sequence for the prevention and rehabilitation of musician injuries, specifically exploring: the prevalence of injuries in professional and amateur musicians; explanations of common and rare musician injuries; possible factors contributing to injury; and injury prevention and rehabilitation. It will introduce and focus on possible benefits of practicing ELDOA (Etirements Longitudinaux avec Decoaptation Osteo-Articulaire, or in English, Longitudinal Osteoarticular Decoaptation Stretches). ELDOA is a relatively unknown conditioning method developed by French osteopath Guy Voyer. It consists of a series of exercises and stretches that help correct body alignment, rehabilitate those with injuries, and prevent injury. Additionally, for injured instrumentalists it may serve to decrease playing-related pain. To understand the possible benefits of ELDOA on musician health, specifically the health of violinists, this study will explore the perceived effects of ELDOA on a group of collegiate violinists through an exploratory pre-survey and post-survey methodology.

Earliest documented studies on occupational and musical injuries. In 1713, physician Bernardo Ramazzini, known as the “Father of Occupational Medicine,” documented occupational hazards by observing and interviewing printers, porters, pressman, seamstresses, weavers, and potters (Abréu-Ramon & Micheo, 2007; Ramazzini, 2001). In 1700, Ramazzini’s article, “De Morbis Artificum Diatriba” or “The Diseases of Workers,” studied how posture and repetitive movements affected workers and prescribed some preventative solutions (Franco & Franco, 2001). Ramazzini came to the conclusion that workers’ diseases were possibly caused by “prolonged, violent, and irregular motions and prolonged postures” (p. 9). His research was limited to nonmusical occupations, yet the postures and repetitive movements he described, such as constant sitting, standing, and arm movements, are motions similar to those found in musicians (Franco, 2011). Additionally, Ramazzini observed the difficulties those occupational workers faced and offered postural suggestions that could be applied to the modern musician, such as frequent breaks and exercise.

Over two centuries after Ramazzini’s studies on occupational health, the earliest modern study investigating and documenting musician pain and injury revealed a high prevalence of musician injury. Specifically, researchers found that 76% of the musician members of International Conference of Symphony and Opera Musicians (ICSOM) had at least one medical problem (Fishbein, Middlestadt, Ottati, Straus, & Ellis, 1988). Middlestadt and Fishbein (1989) re-visited the 1988 study and re-evaluated the survey data with the purpose of identifying musculoskeletal issues. The musculoskeletal issues from the survey were categorized and determined to be statistically significant by gender, location of pain, and instrument. They found that women reported more medical problems than men, pain was most frequent in the back, shoulders, and neck, and that string players had the most musculoskeletal issues. The current

thesis study will similarly investigate prevalence of musician injury but will further limit the participant population to collegiate violinists.

Musicians: susceptible to injury. According to Paull and Harrison (1997), musicians “push themselves to the point of pain or loss of function, [and] the musicians themselves often remain ignorant of the demands that playing makes upon their bodies” (p. 3). Musicians, as with athletes, must take care of their physical health in order to perform at their very best. Musicians today bear great similarity to athletes in their tendency to be injured. However, whenever a collegiate athlete is injured, medical personnel race onto the field to assess what is wrong. If extremely injured, the athlete is helped off the field to loud applause. Additionally, athletes, even young athletes, have daily training with a coach and perform conditioning exercises and warm-ups. Musicians, however, are expected at a young age to self-regulate their own practice routine, and can potentially develop poor habits leading to injury without the assistance of a teacher (Heinan, 2008; Horvath, 2009; Russell & Benedetto, 2014). Horvath (2009) states: “repetitive action, especially combined with poor posture, excessive force and stress, brings about overuse injuries” (p. 27). By bringing body awareness into the practicing sessions and classroom settings, musicians become more aware of physical pain, and will be able to work towards alleviating the pain and tension by completing body-specific stretches (Cooper, Hamann, & Frost, 2012).

Possible factors contributing to musician injury. The causes of injury appear quite numerous and commonly include body size, physical build, amount of physical conditioning, muscle imbalances, fatigue/lack of rest, extrinsic factors, stress, muscle misuse, quick change in technique, sudden increase or decrease in playing time, poor technique or posture, a lack of mental or physical breaks, incorrect instrument size, negative environmental factors, and intensity (Fry, 1987; Horvath, 2009; Manchester, 2010; Manchester, 2012; Norris & Torch,

1993). Additionally, Manchester (2009) concludes that young musicians are not as susceptible to injury as professional adults, and therefore believes that age is a risk factor. The physical ailments that musicians face are numerous, yet many can be prevented with strengthening and stretching the muscles that musicians repetitively use each day. There is not a cure-all answer, but with knowledge of these risk factors, musicians could change their lifestyle in order to have a healthier body thus prevent future injuries. In general, more research is needed on possible factors for musician injury, since most of the existing literature grazes the topic and instead focuses on the prevalence of injuries. In addition to investigating the prevalence of injuries in collegiate violinists, this study will investigate possible causes of injury such as practicing length, breaks, warm-ups, technique, and environmental factors.

Musician injuries in the academic literature. Although this study is primarily on the prevalence of musician injuries and preventative measures, understanding specific injuries amongst musicians is necessary. Literature is limited on how these injuries affect musicians, and instead focuses on the explanations of injuries. “Musculoskeletal” injuries may be divided into three basic categories: inflammatory (i.e. repetitive stress or overuse injuries); nerve entrapment; and degenerative/motor dysfunction (Toledo et al., 2004). Studies investigating musician injuries have found that the most common overuse injuries for string players include myofascial pain and wrist tendonitis, but also include less common and more serious injuries such as carpal tunnel (Brandfonbrener, 1986; Palac 2012; Zetterberg, Backlund, & Karlsson, 1998). The most well-known inflammatory, nerve entrapment, and degenerative disorders will be discussed from researcher and medical perspectives throughout this thesis, including information on prevention and current treatment options.

Repetitive stress injury (RSI), or overuse, is typically the most common and frequent in musicians and can result in loss of function or control since the muscles are strained beyond their normal physical limit (Bejjani, Kaye, & Benham, 1996; Fry, 1987; Norris & Torch, 1993). The National Institute of Neurological Disorders and Stroke defines RSI, which they term repetitive motion disorder, as a muscular condition resulting from repeated motions that mostly affect nerves, tendons, and ligaments in the body (“NINDS Repetitive Motion Disorders Information Page,” 2013). Culf (1998) calls RSI overuse injury and defines it as: “damage which occurs as a result of overuse, or inappropriate use, of part of the body” (p. 7). RSI symptoms are described as “persisting pain and tenderness in the muscles and joint ligaments of the upper limb due to excessive use [...]” (Fry, 1987, p. 35). These physical symptoms are usually felt by those who repeatedly use the same muscles in the same “motor action repeatedly and over extended periods of time” (Rietveld, Van Beest, & Kamphuis, 2007, p. 2049). Furthermore, repetitive stress or overuse injuries are more likely to occur if a musician is not physically conditioned, quickly increases the practice time, neglects warm up activities, has poor technique and posture, neglects physical or mental breaks, is under stress, has the wrong size instrument, or experiences negative environmental factors (Norris & Torch, 1993; Manchester, 2010). While these authors provide a basis of understanding regarding RSI, they only attribute injury to the overuse of the musculoskeletal system and do not consider the fascia, which is an integral yet forgotten system in the human body. Fascia refers to the myofascial connective tissue as a whole cellular unit. It holds the human body together and has until recently been ignored, yet is extremely important when understanding how the human body works (Findley, 2011; Functionalpatterns, 2014; RehabWebinars’s Channel, 2013; Schultz & Feitis, 1996). This study will provide information

on how overuse injuries (RSI) affect the health of the fascial chains and how ELDOA may prevent and rehabilitate musicians battling injuries by realigning the fascia.

Nerve Entrapment is an overall term used to classify more serious and rare repetitive injuries. Lederman (1993) explains that nerve entrapments are:

Disorders of nerve function associated with a lesion localized to a predictable anatomic site at which the nerve may be subject to compression, stretch, or friction. [...] Pressure may be exerted on the nerve between two intrinsic structures such as bone, ligament, fibrous band, or muscle (p. 35).

Carpal tunnel, the most familiar injury, occurs when the median nerve is trapped within the wrist, and thoracic outlet syndrome defines when the nerves are trapped in the neck and shoulder areas of the body (Palac, 2012). Those diagnosed with carpal tunnel syndrome describe symptoms of tingling or numbness (Lederman, 1993).

Ulnar Neuropathy, another nerve entrapment syndrome, occurs when the ulnar nerve compresses at the elbow, usually at the “funny bone”. The ulnar nerve, which is not protected by bone or muscle, is connected to the little finger on the hand. An injury to the ulnar nerve, therefore, directly affects the mobility of the hand. The pain felt at either elbow will be felt “in the sensory distribution of the ulnar nerve, which includes the little finger, medial half of the ring finger, [and parts of the hands and wrists]” (Lederman, 1993, p. 36). Musicians that experience pain or fatigue usually play through it, due to the stigma that is often attached to an injury. If musicians ignore the small tingling sensations or slight aches, the pain can increase and eventually develop into damaging and career ending disorders, such as nerve entrapment or carpal tunnel. It is important for musicians, especially young musicians, to understand the risk

factors that could lead to injury and to ignore the stigma that is supposedly attached to musicians with injuries.

Stigma of injured musicians. Until recently, musicians tended to keep their injuries quiet due to a perceived stigma. Zaza, Charles, & Muszynski (1998) describe the negative stigma of injury as “diminished respect, and tarnished reputation [...] Because many musicians supplement their income with freelance work, their professional reputation is vital to their financial well-being,” (p. 1019). The stigma is the fear of being identified as injured. Musicians are easily replaceable in highly demanding jobs, such as in large orchestras, because there are so many musicians wanting an audition for well-known orchestras. An injury could mean the end of a career without the proper support and rehabilitation. Playing through pain (the ‘no pain, no gain’ concept) is an overarching cause for injury, and many musicians play through pain to keep it hidden. Professional athletes, similar to musicians, have the potential to injure themselves. Some musicians, however, may choose to keep their injuries to themselves and play through pain thinking they can fix it themselves. Athletes have coaches and medics at every practice and game, ready to assist them off the field and musicians do not have that luxury (Zaza, Charles, Muszynski, 1998; Paull & Harrison, 1999; Quarrier, 2013; Quarrier 1993; Horvath, 2002).

Pianists Gary Graffman and Leon Fleisher were the first concert artists in the 20th century to publically announce their injuries (Trollinger, 2005). Fleisher, around 1965, started to notice numbness in his right hand, more specifically in his fourth finger and “in the 60s the effects of repetitive motion on the human body were poorly understood, and Fleisher responded by practicing even harder” (Teachout, 2011, p. 66). Teachout also states that Fleisher tried different types of treatments, yet the diagnosis of focal dystonia “triggered by repetitive movement” (p. 66) was not discovered “until the turn of the 21st century” (p. 66).

Similarly, Graffman slowly lost control of his fourth finger on his right hand and was diagnosed with focal dystonia. He had no pain, tingling, numbness, or physical signs of injury (Graffman, 1986). He had difficulty when playing a series of octaves, especially when trying to play the higher octaves, when the fourth finger would curl into the palm, causing the fifth finger to contract and play incorrect notes (Graffman, 1986). Describing the stigma surrounding his injury, Graffman explained: “Instrumentalists’ hand problems are like social diseases [and are] unmentionable. Understandably so: if a performer is still performing, or hopes to get back on the road soon, he’d be crazy to advertise his disabilities. Nobody wants a wounded pianist” (p. 5). Graffman’s description exemplifies why musicians commonly hide their injuries in order to continue working and competing for competitive positions.

Today, research has increased in regard to musician related injuries and ways to prevent such injuries, but the stigma still remains. Injured musicians may continue to play through perceived pain to prove their self-worth in order to avoid a stigma placed on them, potentially injuring themselves to the point where they have to stop playing (Brandfonbrener, 1986; Brandfonbrener & Kjelland, 2002). Additionally, “Musicians play through muscle fatigue, a precursor for injuries, because most subscribe to notions such as ‘no pain, no gain,’ [and subsequently are] likely to deny that such [performance-related] symptoms [have] deleterious effect on their practice” (Kreutz, Ginsborg, & Williamon, 2009, p. 9). The concept of the “injured musician stigma” is important to understand and acknowledge. If the wider musical community was aware that they are susceptible to injury, then they may be apt to put time and effort into preventing injuries. By introducing ELDOA to musicians, they may experience an increased awareness of their own body and can avoid playing through pain, therefore avoiding injury and the stigma of being an injured musician.

Injury prevention and treatments. According to Guptill and Zaza (2010) and Brooks (1993), the most frequent injury prevention techniques include: warming up on and away from the instrument, taking breaks, postural awareness, instrumental technique, repetitions, and pacing. Guptill and Zaza (2010) state that string players should play slow open strings or slow paced scales and arpeggios as instrument warm-ups, however, literature is limited on the effects and importance of stretching, physical warm-ups, and dynamic or static stretching. The authors reinforce that the “safest way to approach [stretching] is to go slowly and gently and to avoid any stretching that causes pain. It is helpful to adopt postures that are different from those used in playing” (pp. 29-30). They also discuss the importance of a “cool-down” as a preventative measure, yet there is no research to support this. Finally, the researchers argue that breaks from practicing in addition to stretching are important.

In addition to the use of warm-ups, stretching, and taking breaks, Guptill and Zaza (2010) suggest that instrumentalists should observe their playing position, should be aware of the natural curvatures and shape of their spine, and should not play in static sitting or standing positions. For example, players should avoid locking the knees when standing; and when sitting, the waist or hips should be slightly higher than the knees. Finally, they suggest that to eliminate tension while playing, musicians should be well set up. Teachers should work with students to “develop technique at a pace that is achievable for the student and without over practicing, while being alert to unnecessary tension” (p. 31).

When practicing, repetition is obviously important, but should be done carefully to avoid strain and stress injuries. Slow practice and “mental (cognitive) practicing (practicing away from the instrument) can help reduce repetition, and can benefit the learning process” (p. 31). Progressive and incremental training and practicing regimes that are well timed and paced will

also help in the prevention of injuries. When practicing, students should learn how to pace themselves, since cramming for performances may lead to injury.

Regarding treatments for musician injury, Lederman (1993) and Watson (2009) give the following treatments: splinting to provide support to the limbs, physical therapy, application of ice, rest, physiotherapy (such as yoga, Alexander Technique, bodywork, and body mapping), medicine, and surgery as a last resort. Additionally, change of set-up, technique, or repertoire can also assist in preventing injury (Zetterberg, Backlund, Karlsson, Wener, & Olsson, 1998). ELDOA may serve as an additional preventative and rehabilitative measure allowing musicians to avoid injury or additional invasive treatments such as surgery. ELDOA may even prove to be effective in that splints, medicine, and surgery might be avoided.

Basic human anatomy in relation to musculoskeletal disorders. Musicians rely on a healthy musculoskeletal system to help perform at their best. Overall, the human body is complex in design and function. Joints connect 27 bones in the hand. The muscles allow for extensions and flexions, while the muscles surrounding the bones are pulled (lengthened) and contracted (shortened). Nine wrist tendons run across the wrist through the carpal tunnel, a ligament in the wrist. Attached to the muscles are nerves that send signals to the brain and spinal cord (Culf, 1998). Musicians use joints, muscles, tendons, ligaments, and bones to perform.

The majority of musician-health research focuses on “musculoskeletal” and “neurological” disorders, yet the term *musculoskeletal* only involves the muscles and the skeletal system. According to Nordin and Frankel (2012), “The purpose of the musculoskeletal system is to protect internal organs, provide rigid kinematic links and muscle attachment sites, and facilitate muscle action and body movement” (p. 27). Present musician-injury research neglects to include the fascia in the understanding of the term *musculoskeletal*, yet the fascia is just

as important to the human body as the musculoskeletal system; both work together to create basic human movements. Voyer (2003) describes the fascia as being divided into three layers: superficial, middle, and deep. The superficial layer includes: the skin, the middle layer includes the epicranial aponeurosis (covers the upper part of the cranium), fascia superficialis (located near the surface of body), and the aponeuroses (tendons) which is the deep layer of the dura mater. The dura mater is either in the spine or cranium and consists of an external and internal membrane layer that surrounds the brain. Hammer (2000) defines the fascia as a “band or sheet of areolar or fibro-elastic tissue which [surrounds] the body beneath the skin (superficial fascia), [...] separates the muscles into layers, and surrounds the structures as nerves, blood vessels and lymphatics” (p.1). Voyer (2003) describes the fascia as the “guardians of our whole body, and also the link which justifies the global interactions between the biomechanical segments, the physiological organs and the biological liquids [...they also assert] shape, volume, position and mobility” (p. 34).

In order to continue playing, musicians need to maintain a healthy body, which includes healthy fascia because if the “fascial body is well trained [...] elastic and resilient, then it can be relied on to perform effectively and at the same time to offer a high degree of injury prevention” (Muller & Schleip, 2012, p. 104). Maintaining movement and staying hydrated are two ways to have healthy fascia, however, repetitive movements actually assist in drying out the gelatinous water inside the fascia, and therefore varied movements will help keep the fascial system healthy allowing for the tissues to rehydrate (Findley, 2011; Wellcast, 2012). Because musicians move isolated muscles and tendons while playing their instrument, the fascia becomes tight and therefore has a limited range of motion. For a violinist, the fascia will become tight since the bow arm moves in one motion repetitively. As a result, fascia surrounding the arm and elbow

will only have the flexibility that is needed to complete that certain task or motion. Without varying motions with warm-ups or exercise, the fascia and muscles will become tight, causing stress and fatigue and leading to eventual injury. Musician injuries could be avoided by a focus on prevention of injury through ELDOA.

ELDOA as a prevention and rehabilitation option. ELDOA stands for “Etirements Longitudinaux avec Decoaptation Osteo-Articulaire” or in English “Longitudinal Stretching with Osteo Articular Decoaptation.” ELDOA is a series of exercises and movements that uses the center of gravity and locates a target area of the spine that needs to be either mobilized or re-aligned by placing and maintaining tension on the fascia (Voyer, 2003). Guy Voyer, an osteopath, developed his exercise method between 1977 and 1978, and synthesized “various therapeutic methods, each of which engaged a process of normalization, but needed refinement to overcome inherent difficulties” (p. 13). The goal of this method is to “find a posture that targets a specific vertebral level, in reference at all times to an absolute fixed and mobile point, which, when placed under a self induced tension, results in a precise osteoarticular decoaptation” (p. 20). The fascia, defined in the anatomy section above, is integral to how ELDOA affects the body. Voyer states that “myofascial stretches respect the anatomy of the muscles, their aponeuroses as well as their function. At this point, the analytical study of the fascial chains allows for an incredibly effective stretch position” (“SomaTraining,” n.d.). Certain stretches or exercises target different areas of the spine, using the lumbar, thoracic, cervical, and pelvic target areas. The purpose of ELDOA is to help manage stress and create space in the vertebral joints, allowing muscles to move freely. The results of these stretches include joint mobility, increased absorption of fluid within the discs of the spine, flexibility, improved muscle tone, postural alignment, body-mind connection, and coordination (Kerr, 2013). The tension and release

created by these stretches help normalize the posture (Hammer, 2000). The effects of ELDOA will be examined in this study as a prevention and rehabilitation method for violinists.

Problem Statement

Musicians are prone to injury and continue playing through pain to avoid the stigma of being injured. Existing research discusses the prevalence of injury amongst musicians. Research is limited on *how* and *why* musicians are prone to injury and there is little mention of prevention and rehabilitation methods. The focus of this study, therefore, is to explore ELDOA as a preventative and alternative treatment for injury.

Purpose of the Study

This exploratory study surveys violinists at the Jacobs School of Music (JSOM) about perceived pain and to examine the benefits that osteopath Guy Voyer's ELDOA set of exercises have on JSOM violinists.

Research Questions:

1. Do collegiate violinists in the JSOM University setting experience physical pain in relation to playing their instrument? If so, where do they experience it?
2. Does perceived pain increase or decrease as students participate in ELDOA sessions?
3. Are there physical, mental, and emotional benefits of ELDOA?

Delimitations

This brief exploratory study does not explore in-depth descriptions of injuries. It is a broad overview of potential injuries that musicians might deal with throughout their training and playing careers. The epidemiology, etiology, intervention, and prevention will be briefly discussed, but a thorough investigation of these injuries is outside the scope of this study.

Definition of Terms:

ELDOA: Set of precise exercises created by Guy Voyer that de-coapts certain target areas of the body to create space and proper alignment.

Musculoskeletal: Term describing the human anatomy that involves the muscular system and the skeletal system.

Fascia: Myofascial connective tissue as a whole cellular unit that holds the human body together. There are nine fascial chains in the body and all chains are connected.

Repetitive Stress Injury: Term for overuse; a loss of function or control since the muscles are strained beyond their normal physical limit.

Carpal Tunnel: Overuse injury where the median nerve is trapped within the wrist, usually with symptoms of tingling or numbness.

Thoracic Outlet Syndrome: When nerves are trapped in the neck and shoulder areas of the body.

Ulnar Neuropathy: Nerve entrapment syndrome that occurs when the ulnar nerve compresses at the elbow, directly affecting the mobility of the hand.

Focal Dystonia: A rare neurological disorder within the central nervous system frequently caused by repetitive movements resulting in relentless muscle spasms.

CHAPTER II:

Review of Related Literature

Multiple researchers have studied the prevalence of injury amongst professional musicians, conservatory students, and young students. Themes of age, gender, and instrument are common throughout the research. The areas of the body on string players that are most frequently affected are the shoulders, wrists, elbow, and neck. The most frequently researched intervention or prevention method for string students are warm-ups, and research on the effects of warm-ups will be discussed further in this literature review. Research is extremely limited on ELDOA, yet interviews will help create an understanding of what ELDOA is and how it can help musicians, in this case violinists. This review of related literature will be divided into the following categories: the prevalence of injuries among professional musicians, pre-college and collegiate musicians, combination of collegiate and professional musicians; environmental risk factors and location of injuries; warm-ups as a method for injury prevention; and ELDOA.

Prevalence of Injury and Location of Pain: Professional

Professional Organizations and Orchestras. In the first study examining musician injuries, Fishbein, Middlestadt, Ottati, Strauss, & Ellis (1988, reprint from 1987) surveyed members of the International Conference of Symphony and Opera Musicians (ISCOM) via a questionnaire. The purpose of this study was to investigate the prevalence of injury within the ISCOM where prevalence was defined as “the percent of a population with a given problem at a given time, not to the likelihood of developing that problem” (p. 5). Participants included members from the 48 orchestras in ICSOM. The orchestras were categorized into four groupings: 13 small, 13 medium, 13 large, and 7 special orchestras (i.e. ballet, chamber, lyric ensembles)

totaling 4,025 members. Participants were also grouped according to age range: under 35, between 35-45, and over 45.

Of those members, 2,212, or 55% completed a questionnaire that surveyed medical problems, locations of medical problems, non-musculoskeletal problems, musculoskeletal symptoms, musculoskeletal diagnoses, and medical treatments. Participants indicated the severity of these issues and which treatments were effective. Additionally, they provided general demographic information including age, gender, instrument, length of instrument study, length of time in their respective ensemble, and health habits or routines.

Results indicated that 82% of the participants had experienced playing-related injuries, and 76% performed with at least one instrument-related medical problem at the time of the survey. Stage fright was cited as the most prevalent medical problem amongst participants; the neck, shoulder, and back were the most prevalent locations of pain. Regarding age, musicians in the second grouping (35-45 years) had the most injuries, with 86% indicating at least one medical problem and 81% reporting at least one severe injury. Interestingly, 80% under 35 and over 45 years of age had at least one medical problem, and 77% under age 35 and 71% over the age of 45 reported at least one severe injury, suggesting a high prevalence of reported injury over all age ranges. Regarding severe injury, participants were allowed to circle more than one, resulting in 36% indicating up to four severe problems. Significantly, 84% of string players reported having at least one medical problem and 78% reported at least one severe problem.

Middlestadt and Fishbein (1989) completed a follow-up analysis of Fishbein et al. (1988), using the data from the original study and focusing only on the “severe” musculoskeletal problems amongst string instrumentalists. The researchers focused specifically on injuries perceived as severely affecting performance. Importantly, 66% of string players reported having

a musculoskeletal problem, 46% reported a non-musculoskeletal problem, and 78% had some type of severe musculoskeletal problem. These numbers were higher for strings than any other orchestral instrument group. Overall, for string players, the shoulders, neck, hands, and lower back were the most common locations for severe pain. Specifically, 16% of all string players documented severe pain in the right shoulder and 14% in the left shoulder; 14% reported pain in both right and left sides of the neck; 12% reported pain in the left hand, and 6% in the right; 14% reported pain in the right lower back, and 12% in the left lower back. It is interesting to note the results for severe pain for violin players, with 16% indicating severe pain in the right shoulder and 15% in the left shoulder; 15% in the right side of the neck and 16% in the left side of the neck; 13% in the left hand and 6% in the right hand; and 13% in the right lower back and 10% in the left lower back. These responses indicate a higher prevalence of overall pain in the left upper body and the right lower body. These responses provide a foundation for future studies, especially for specific injury location studies.

In an additional study investigating the prevalence of musician-related injuries, Paarup, Baelum, Holm, Manniche, and Wedderkopp (2011) surveyed 441 Danish orchestral musicians of which 344 (78%) completed the survey using the “Standard Nordic Questionnaire.” This specific survey was developed to standardize the analysis of musculoskeletal systems in multiple work-related environments by Kuorinka, Jonsson, Kilbom, Vinterberg, Biering-Sørensen, Andersson, & Jørgensen, (1987). The purpose of the study was to examine the prevalence, duration and consequences of professional orchestral musicians’ musculoskeletal injuries. Musicians located musculoskeletal pain in the upper limbs, neck, and wrists, which affected the level of performance. Interestingly, female participants reported more symptoms than males in the neck, upper back, shoulders, and wrists, however the researchers did not investigate why. Furthermore,

this study included the implications of musician-related injuries without investigating additional factors (such as environmental stress, overall health, and previous injury).

Fotiadis, Fotiadou, Kokaridas, and Mylonas (2013) designed a study to explore the frequency of injury prevalence in musicians within two professional-level orchestras in Greece: the Athens Symphony and the Thessaloniki State Symphony. Of 227 total musicians, 147 completed a questionnaire. Participants were full-time musicians and 63.6% were string players. Data was collected using the same “Standardized Nordic Questionnaire.” Questions focused on the prevalence of injuries in the neck, shoulder, back, elbow, wrists, hands, oral area, and other regions of the body. Participants rated their pain on a five-point Likert-type scale from “none” to “very much.” Significantly, results indicated that 81% of participants had suffered an injury at least once in relation to their instrument, 81.6% experienced some sort of musculoskeletal disorder, and 66.4% of the musicians claimed that the problems influenced their ability to perform. Furthermore, the researchers found that if musicians had a previous musculoskeletal injury than they were more likely to have problems in other locations of the body, suggesting that previous injury could indicate a higher risk for further injuries and thus the need for preventative techniques. String players had more statistically significant pain in the shoulders and oral region compared to any other body region. The shoulders had a result of a mean of 2.57 and the p value of .000 and the oral region of the body had a mean of 1.03 and a p value of .000. These areas were also more affected in string players than any other instrument group.

In addition to prevalence and location of injury, this study also examined outside factors. The survey asked for participants’ level of conditioning and physical exercise. They found that 45.2% did not exercise and 54.8% did some sort of exercise including walking or swimming for at least 30 minutes per week. Information was lacking in the specific types of exercises and how

they specifically affect the muscles used to play instruments. Additionally, this study discussed the stigma attached to musician-related injuries. Within the two orchestras, the musicians neglected to take any sick leave, and the study suggested that the participants were intimidated by “diagnosis, prevention, and professional advice on health issues” (p. 94), which could be a possible factor contributing to musicians’ continued injury.

Abréu-Ramos and Micheo (2007) focused on the prevalence of musculoskeletal problems in the upper body, with the purpose of investigating correlations between injuries with intrinsic risk factors of age, gender, body habits, and extrinsic factors including instrument played, years of study, and poor playing posture. Participants ($n = 75$) were members of the Puerto Rico Symphony Orchestra, and, interestingly for the purposes of the current study, 32 were in the category of violin or violists (upper strings). The average age of participants was 37.9 years old and participants had to be over the age of 21. Members documented an average of 26.5 years of playing experience. The younger and older age groups practiced an average of 28.7-32 hours per week. Similar to previous studies of injury prevalence (Fishbein et al., 1988), participants were grouped into age categories: ages 22-29, 30-39, 40-49, and 50-61.

A researcher designed questionnaire asked for demographic information such as playing habits, instrument, location of seat in orchestra, pain or weakness, previous injuries, and medical history. The study further included a physical exam, conducted by the principal researcher, of the upper body. This exam included “inspection, palpation, range of motion of the neck, back, and upper extremities in all their planes, manual muscle testing of the upper extremities including handgrip dynamometer measurements” (p. 98). Results indicated that 83.6% of participants attributed their injuries to playing. Musculoskeletal disorders affecting playing abilities were reported by 81.3% of all participants and by 78.1% of upper strings. Similar to other studies

(Middlestadt et al., 1989; Fotiadis et al., 2013), upper strings reported the most prevalent instances of pain affecting the neck, back, and shoulders. Factors that led to these injuries were attributed to hours of playing and technique. The participants selected rest, stretching, and posture change as ways to alleviate the pain. The researchers found that 69 participants had some sort of warm-up routine and 15 had a cool-down routine; for upper strings, 28 reported warm-up routines and only four reported a cool-down routine. Regarding age categories, the age groups citing the most musculoskeletal disorders, the youngest age grouping (83.3%) and the oldest age grouping (90%), also reported the highest number of practicing hours. However, this contradicts Fishbein et al. (1988), who reported that musicians between the ages of 35-45 had the most injuries in their study. This suggests a need for more research about specific age groups. While this study examined the frequency of warm-up and cool-down routines, it lacked specific explanations of what these might look like.

Prevalence of injury in Pre-College and Collegiate settings. Musculoskeletal pain and disorders are prevalent not only for professional orchestral musicians, but also for children and collegiate students that are learning music. Literature does exist on the prevalence of injury for pre-college students, but is limited and not necessarily instrumental specific. Two studies focused on instrumental injuries in pre-college settings: Ranelli, Smith, and Straker (2008) and Britsch (2005). For collegiate settings, Brandfonbrener (2009), Kreutz, Ginsborg, and Williamon (2009), and Williamon and Thomspson (2006) studied the prevalence of injuries for university-aged students.

Ranelli, Smith, and Straker (2008) administered a cross-sectional questionnaire to 731 primary and secondary children in instrumental programs in Perth, Australia to investigate the

prevalence of injury in young musicians. Students who participated in the study were between the ages of seven and 17; of the 731 participants, 460 were female.

The questionnaire was designed to identify possible risk factors, prevalence of injuries, and the location of these injuries. Questions asked participants to identify the pain location and rate the pain. Additionally, participants were asked about their practice habits, music playing experience, as well as if the children participated in physical activity, art, or computer use.

Sixty-seven percent reported having pain at some point and pain was more prevalent amongst female participants. Thirty percent of the musicians stated that they were unable to play an instrument due to pain, and 53.2% had experienced pain within the last month. The researchers also found that there was a correlation between the amount of hours practiced and the prevalence of pain; weekly time practiced ranged from 17 minutes to 41 hours. Similar to Abréu-Ramos et al. (2007) and Middlestadt et al. (1989), upper and lower string players had a higher prevalence of injury than other instruments. More longitudinal research is necessary to observe if those children that felt pain were more likely to be diagnosed with an injury later in life. This study does not address what levels the students were at or what kind of music they were playing. The intensity and difficulty of the music could in fact affect the prevalence of injury as well, and this is not discussed in the study.

Britsch (2005) also studied the prevalence of injuries amongst young musicians by creating a cross-sectional study surveying 255 musicians in four youth orchestras in a Midwest city. The purpose of the study was to identify certain factors related to musician injuries and examine if students were aware of educational prevention techniques. The four levels of orchestras that participated in the study were: the String Orchestra (ages nine-15, $n=30$), the Junior Symphony (ages 12-17, $n=22$), the Classical Orchestra (ages 13-16, $n=120$), and the

Youth Symphony (ages 9-18, $N=33$). The mean of the ages was 13.5, with a range of 2-13 years of playing experience.

For the survey, students were asked about their practicing habits, if they play through pain, if they had discomfort due to playing, and if it “is okay to play with pain.” The students had to rate certain locations and levels of perceived pain on a “discomfort rating scale” which ranged from 0 or “no pain” to 5 or “the pain is so bad I can’t do other things” (p. 41). Of all four orchestral groups, 46% reported feeling pain at least once while playing, yet 55% were not experiencing pain at the time the study took place. Thirty-eight percent had current pain, and 10% had intermittent pain. In the Youth Symphony, the top group, 65% reported current problems. In the Youth Symphony, 68% reported taking breaks, but only 46% of the youngest group reported taking breaks. However, the researchers did not explain the definition of “breaks.” Interestingly, students defined their individual warm-ups as: scale practice (72%), slow pieces (20%), and stretching (15%). Ten percent did “other” warm-ups. The students were also asked if they believed in playing through pain, and the results varied according to their respective orchestra to which overall, 55% replied “no” and 35% replied “yes.”

Similar to other studies, pain locations that were most frequently cited by the participants were neck, shoulders, wrists, low back, fingers, and thumbs. This study also encourages musicians and teachers to become aware of injury prevention techniques as well as express concerns that young children are experiencing instrument-related pain at an early stage, especially as they enter the collegiate environment as discussed by Brandfonbrener (2009).

In her 2009 study, Brandfonbrener (2009) sought to identify the prevalence of injury amongst students entering their first year at Northwestern University. She surveyed 330 incoming freshman music students, 46% men and 54% women, in four consecutive freshman

classes at Northwestern University. They were asked to report on their own personal history in dealing with playing-related injuries. From the survey, between 84-87% percent of strings, keyboards, winds, and brass players reported entering Northwestern with injury. This study was unable to identify factors that influenced the amount of pain but provides significant proof that both musicians in good health or poor health had an occurrence of playing-related pain before entering school and completing the survey. Results were categorized by: instrument class and pain, gender and pain, years of study versus pain, exercise habits and pain, and performance anxiety and pain. Regarding string players, 73 violinists (86%) were entering their freshman year with a history of pain. This study provided evidence that incoming students coming into a new environment have been experiencing pain prior to entering, although Brandfonbrener explained that further research is needed. Since the transition from high school to college is difficult, Brandfonbrener suggests that knowing the history of the freshman could help the teachers in providing assistance to prevent more physical problems from occurring. Interestingly, she also discussed the fact that many incoming students keep pain a secret in the early years of school.

In conclusion, Brandfonbrener did not identify factors attributed to pain through her three years of surveying incoming freshman, but she acknowledged that more research is needed to identify which specific emotional and physical challenges incoming students specifically deal with, and what they attribute to their pain. Therefore, environmental changes and factors could impact the incoming students as a potential risk factor for physical and non-physical problems.

Kreutz, Ginsborg, and Williamon (2009) surveyed vocalists and instrumentalists from two conservatories in England using “internet inventories.” They investigated health behaviors, emotional state, self-regulation, and self-efficacy amongst conservatory students. The online survey was researcher designed and identical surveys were given out to students at the Royal

Northern College of Music (RNCM) and the Royal College of Music (RCM). A total of 273 student musicians responded and the average age of the participants was divided into two groups by age: 18-22 years and 23-46 years. The male ($n=89$) and female ($n=156$) participants had a mean age of 21.94 years of playing experience. The survey was broken into the following sections: health promoting behaviors, musculoskeletal problems, and overall health. Participants answered questions on basic demographics, instrument played, hours of practice, personal and life habits, and health behaviors which included questions (using a Likert scale) related to physical problems affecting their performance.

The participants were categorized in instrumental groups and for the strings ($n=68$), musculoskeletal problems were 61.8% prevalent, non-musculoskeletal problems (sleep disturbances, stomachache, etc.) were 55.9%, and interference (problems that have interfered with either performing, practicing, or technique) was 26.5%. Researchers found that students' perceived quality of performance increased when they felt less pain. From the survey, 53.5% of the students claimed that they were affected by a musculoskeletal problem related to their performance. The results indicated a prevalence of injury and pain from almost all of the participants. Additionally, musculoskeletal pain was common amongst all participants, yet students were mostly concerned with their social and emotional state of health, rather than their physical health. Therefore, Williamon et al. (2009) explained the need for programs to help young musicians to incorporate healthy life-styles in order to prevent the injuries and problems that young musicians tend to ignore.

Williamon and Thomspon (2006) surveyed conservatory students on awareness and health problems in relation to performing on their instruments. The authors used a previously existing survey/questionnaire to explore: student awareness of health issues, personal

experiences with performance stress, possible causes of performance-related injuries, and what to do if diagnosed with an injury. Sixty-three undergraduates from the Royal College of Music participated in the study. The participants, 19 male and 44 female, had an average age of 19 years. All of the participants “attended an introductory seminar on music and health, as part of a course in professional skills” (p. 413). Of 63 participants, 31 were string players.

For the results, participants rated potential risk factors of physical health problems, and the most frequent were: over practicing, poor technique, bad posture, failure to warm-up, and failure to mentally prepare. In the discussion, the musicians rated performance anxiety as the most common experience of psychological stress with a mean of 4.55, however, they did not discover the severity of the performance anxiety. Researchers found that the neck, shoulders, and back were the most prevalent areas for injuries, yet there was no significant difference amongst each instrument. For the string players, there was a higher mean rating of physical problems for the fingers, wrists, arms and elbows, shoulders, neck, and back. When asked to select the most frequent risk factor for injury, the majority of students rated “bad posture” as the most likely risk factor. More research is needed in regard to instrumentalists entering into the music performance world, yet this study presents the idea that young musicians are aware of certain injury factors, yet need the guidance to prevent and treat such injuries as they enter the conservatory or rigorous performance degrees.

Combination of Collegiate and Professional Musicians. In a study investigating the risk factors amongst collegiate and professional musicians, Ackermann and Adams (2004) recruited 26 violinists and two violists (female $n=21$ and male $n=7$) with a wide age range of 21-60 from three different universities and professional orchestras. These instrumentalists, however, were currently suffering from musician-related injuries. Practicing times for these musicians was

a mean of three hours, and all participants were still able to practice even though they were injured. The participants were asked to rank the listed potential risk factors that contributed to their injuries as well as rate the severity. In addition to the musicians, the researchers had four medical specialists and three physiotherapists participate in the study as well. The highest-ranked risk factors identified were: long hours of practice, sudden increase of practice time, poor posture, technique flaws, insufficient rest breaks, insufficient warm-ups, chair, performance anxiety, environment, muscle tension, warm-up, physical condition, and many more. The musicians ranked “long hours of practice” number one whereas the health experts placed “poor posture” as the first. Travel and touring, which ranked as being influential in developing injuries by musicians but not by health experts, was the main disagreement between the two groups. In their conclusion, the researchers acknowledge that factors related to performance and duration of playing were of greater importance than environmental strains. The authors call for more research on the impact of health education for teachers when educating their young students as a way to prevent injuries.

Environmental Risk Factors and Location of Injuries. Ackermann, Barrett, and Rickert (2013) explored musician and manager perceptions of the work environment to observe if environmental factors attributed to physical injury. In this qualitative study, the researchers interviewed ten professional cellists and five managers from a large Australian orchestra, with an average age between 37 and 52. The interviews were recorded and transcribed, and the participants were able to listen to the recordings as well as read, edit, and clarify their answers.

From the interview answers in this case study, the authors identified that the musicians’ injuries were from performance stress and interpersonal relationships. Overall, the musicians experienced physical tension, work-related upper limb disorders, and social pressure as a result

of their environment, and the majority of sick leave was taken due to injury. The researchers also found that the musicians felt that a potential cause for injury was the schedule, level and amount of repertoire, and rehearsing techniques.

The findings regarding psychosocial risks were focused on the relationship between managers and performers. The researchers found that there were high expectations on section leaders, players, and the conductor, which led to tension and injury. Results and conclusions from the interviews determined that both the orchestra members and the management singled out stress in the environment as a cause for physical tension.

Unlike earlier studies, Ackermann, Barrett, and Rickert (2013) asked participants to provide insight for improvements to alleviate tense environments. The participants suggested that the management provide stress management techniques for orchestra members as a way to develop a supportive work environment in order to improve relationships between the managers and members of the orchestra. The researchers concluded that stress is a psychosocial risk factor for injury. Ackermann, Barrett, and Rickert's study is important because it acknowledges that injuries can come from the social and physical environments.

Lahme, Eibl, and Reichl (2014) looked for patterns of injury in upper string players. From an original group of 28 participants, only 22 were cleared for an analysis. The participant group consisted of amateurs (27.27%), teachers (9.1%), students (27.27%), and professionals (36.36%). The participants (10 female and 12 male) had a mean age of 38.36 and mean years playing their respective instruments was 31.77. The musicians filled out a questionnaire and a physical survey to attempt to find patterns of musculoskeletal pain. Within the questionnaire, the researchers organized areas of musculoskeletal problems in four categories: pain-related, movement constraints, muscle weakness, and paresthesia (tingling, numbness etc.).

The researchers did not ask for a rating of severity. The areas of the body that were statistically significant were the shoulders and elbows, yet the fingers and hands had no significance, unlike previous studies. They also found no differences between the right and left hand side of the body. The difference between the elbow and hand (left or right), however, was statistically significant ($p < 0.05$) and the fingers ($p < 0.01$) on the left hand side of the body were declared more at risk than the right. They made the case at the end of their study the teacher should take a role in injury prevention by looking at the students' physique, and teaching to prevent tension.

Manchester and Fleider (1991) observed hand, wrist, arm, and shoulder injuries of music students between 1986 and 1989 in a music school in the Northeast. For students, a pre-paid health service was in place and the researchers reviewed the data for the cases in which students came in and complained of upper extremity pain. The doctors kept track on a clinic database of the times the students came to seek help. For the duration of the three-year study, 41 men reported 44 instances of injury whereas 73 women reported 78 instances of injury, revealing that women had more incidences of pain compared to men (similar to Fishbein et al., 1988). The musicians were aged 17 to 43 years old and the mean of total years playing was 11 years. Patients ($n=100$) gave information about the factors that could have caused their pain: increased practice time, changed technique, new instrument/teacher, stress, and tension (the type of tension was not specified in this study). Similar to Brandfonbrener's (2009) study, the freshman and sophomores had more incidences of injury than the upperclassmen and graduate students.

Throughout the three-year time frame, a total of 114 students sought medical attention a total of 122 times with performance-related injuries. The majority were performance majors (41 men and 73 women), and only six were non-performance majors. Most importantly, 75%

complained of symptoms lasting for five weeks or less. The reported median duration of student symptoms was between one and two weeks. Violinists and violists had pain in the hands, wrists, forearm and shoulder, with 57 hand problems reported by string players over the three years. Fifty percent of visits to the doctors were diagnosed with overuse syndrome, 16% were for tendinitis, 16% were for “other musculoskeletal” issues, and 11 of the patients were diagnosed with a neurological issue. The doctors prescribed rest, heat, ice, anti-inflammatory drugs, exercise, or suggestions to change technique. The researchers stated that further study would be needed to see if exercise and meditation would lessen the frequency of injury but they did not include this information in the study article.

The studies discussed in this section are important to realize not only the prevalence of injury amongst musicians, but also the specific locations of pain or discomfort. For string players, the common locations are upper extremity locations: shoulders, wrists, elbows, and neck. These trends of injuries may be prevented if musicians are educated on prevention and rehabilitation techniques. Research on string-specific injuries is limited, but do provide evidence that more research is needed as a prevention technique, especially when it comes to the education of young musicians.

Warm-ups for strings as injury prevention. Research is now starting to acknowledge and address the fact that injuries can be prevented and treated in holistic ways. Warm-ups and stretching are the most recently researched in addition to other holistic methods such as yoga, physical therapy, and Alexander Technique. This section will address the results of studies that used stretching and warm-ups as a means of reducing perceived pain in musicians.

Cooper, Hamann, and Frost (2012) determined whether physical interventions during rehearsals affected musicians’ perceived pain or discomfort by designing a quasi-experimental

study. The 126 participants were between the ages of 14 to 18 years and were either in two high school classes or two junior high classes from four Northwestern schools. One hundred students participated, including 35 males and 65 females. Sixty-eight percent played high strings and 32% played low strings. Fifty-seven students were part of the treatment group and only 43 were in the control.

The researchers designed the “Perception of Discomfort” survey, which included demographic information and a Likert-type scale to rate perceived discomfort in the hands, wrist, neck, and shoulder. The stretching segments (taken from *Stretching for Strings* by Winberg & Salus, 1990) lasted for ten-minute intervals and the results were organized by gender, instrument, and age or grade. The stretches that were completed by the treatment group included four sets of wrist rotations, shoulder and deltoid exercises, neck rolls, finger presses, hand-finger extensions, fist clenches, hand wringing, bicep curls, ear to shoulder stretches, handshakes, arm and triceps extensions, and fingers clenching and unclenching. The stretches could happen at any time during the rehearsals, but would last for ten-minute intervals. The data was organized by a two-way multivariate analysis of variance.

Results were significant ($p \leq .0003$) in that the upper strings reported less discomfort before rehearsals than after rehearsals. The low strings, however, felt discomfort more severely before rehearsal rather than after rehearsal. Those participants that did the prescribed treatment felt less pain after the rehearsals and treatment compared to the control group that felt more discomfort after the rehearsals. Additionally, the students that participated in the stretches felt lower body pain and discomfort. The researchers found that “participants who were administered periodic [stretching] exercises had significantly lower perceptions of discomfort than the control group participants” (p. 75). The authors confirm that the students that were participating in the

stretching exercises were more aware of strategies to reduce the amount of playing-related discomfort. The authors discussed further research on the effects of stretching for specific string instruments. The authors speculate that perhaps if the correct warm-ups were taught to young students early on, they would be more likely to continue into their collegiate and professional careers thus reducing the risk factors of injury later on in life.

Russell (2006) studied the influence of warm-ups on the perceived health of public middle school string players from a metro-city in the western United States. He wanted to explore if warming up affected students' perceived pain. Additionally, he wanted to identify which warm-ups were the most influential on the perceived pain of young students. One-hundred and fifty-eight sixth grade ($n=76$), seventh grade ($n=51$) and eighth grade ($n=31$) students participated in this study and were members of a collection of six public school orchestras in the area. Females represented 59% of the group and males 41%, and the majority of the students began playing in the sixth grade. Cello, violin, viola, and bass players represented the participants of the study, and the violinists represented 55% of the orchestral participants.

Russell created the "Physical Discomfort Questionnaire" with the purpose to explore the location and ratings of pain or discomfort in the middle school string students. He does not explain how or where he got the information for his questionnaire. The students rated their pain on a five-point scale labeled "no discomfort" to "extreme discomfort." At the end of the survey participants were asked to explain their warm-up habits and the duration of the warm-ups. He went to every participating school and gave the students the questionnaire to complete.

The results showed that many of them did not actually feel pain or discomfort, but the locations with the highest amount of pain were the left and right shoulders, left upper back, and fingers. What varied were the warm-ups that were performed by the students: 12% percent did

not learn any warm-up strategies, whereas 88% of them learned warm-ups from either a private teacher or schoolteacher. Of the participants, 63% of the students spent between 1-5 minutes on warm-ups, but the results of the study indicated that neither frequency nor duration of warm-ups affected the amount of pain that students felt. Russell had no explanation for those results.

Overall, Russell found that there were no statistically significant results with warm-ups on discomfort. Russell does not state what warm-ups the students did, or who taught them warm-ups. The research is quite limited in that regard. He could have expanded the study to teach warm-ups to students and then compare the results to an independent group, because many of the students might not be aware of how to properly warm-up with and without the instrument. The one factor that was significant was that the sixth graders felt more discomfort than the older students, and Russell argued that it is because they need to physically mature and form good playing technique. He hypothesized that “physical development may play a greater role in the physical discomfort of middle school players than warm-up activities” (p. 10).

Young students, around middle school age, may not be totally aware of their bodies due to the fact that they are going through developmental stages and are not fully self-regulated in practicing. Therefore, this study is weak in that it does not acknowledge that students in their first three years of playing might not feel pain, and might not be playing enough to hurt. Russell does argue, however, for the importance of warming up as a prevention technique.

Building upon his earlier 2006 study, Russell and co-researcher Benedetto (2014) identified the parts of the body where string players felt the most discomfort. Participants were in a public elementary ($n=170$), two middle schools ($n=75$ and $n=45$), and two high schools ($n=75$ and $n=190$). The students were asked to fill out a questionnaire, which was adapted from Russell (2006), in order to identify: the locations of discomfort, existing (if any) warm-ups, or physical

activity that might impact students' perceived discomfort. An interesting change from the previous survey was that the researchers edited the language of the survey to be understood by elementary aged students.

They found that discomfort was related to class frequency, stress about playing, and how much students enjoyed playing. The students did not feel discomfort while playing, but when not playing the highest levels of discomfort were located in the right shoulder, left upper back, and left fingers. When asked if they had experience with warm-ups, only 18.3% stated "always," and 5.9% "never," and 58.4% stated either "sometimes" or "usually." When asked how they warmed up, only 20% responded "stretching." The researchers were unable to identify specific factors that could have been possible causes for injury or pain or numerical significant differences that would prove that warm-ups affect perceived pain, yet they still advocate for educators to observe their students and to find ways to maintain student health. Overall, just as in his 2006 study, Russell argues for the importance of warm-ups, but his study would have been more beneficial if he actually taught all the students specific warm-ups to include in their rehearsals and practicing schedules and then measured the results.

ELDOA. Little research has been done on ELDOA and the effects of ELDOA. This study is the first documented time ELDOA has been studied in relation to musicians. ELDOA stands for "Etirements Longitudinaux avec Decoaptation Osteo-Articulaire" or in English "Longitudinal Stretching with OsteoArticular Decoaptation." The only written work on ELDOA is on Voyer's website and in his handbook that he gives to all ELDOA trainees. The handbook entitled "Les ELDOA" ("The ELDOA") discusses the reasons for ELDOA, the biomechanical review of the spine, applications, the positions, and the progression factors of ELDOA. The ELDOAs "target a specific vertebral level, in reference at all times to an absolute fixed and

mobile point, which, when placed under a self-induced tension, results in a precise osteoarticular decoaptation” (Voyer, 2003, p. 20). The general effects of these postures normalize myofascial tension, while respecting the structural imbalance of each person while trying to correct these imbalances. The postures are introduced in a progressive fashion and should be done with instruction from someone who is trained in the ELDOAs (Voyer, 2003). By using the center of gravity, one can locate the target area of the spine that needs to be re-aligned (Voyer, 2003). The ELDOAs work “when the fascial connections of the body are precisely positioned and put under tension, the ELDOA creates space in a joint causing a cascade of healing events to occur” (Eldoa-institute, 2015). Certain postures that use the center of gravity are described and pictured in Appendix C. According to the Evolutions Institute, the ELDOA improves spinal alignment, kinesthetic sense, normalization of the autonomic nervous system, and increased muscle tone (Evolutions Institute, 2016).

Due to the lack of research on ELDOA, interview questions were sent out to two people who practice or instruct ELDOA: Brian Murer, a licensed chiropractor and Alex Kerr, a professional violinist in the Dallas Symphony and Professor of Violin at Indiana University. Both use ELDOA as a rehabilitation method in their respective professions. Dr. Brian Murer works for Bloomington Health and Wellness Center, and is a past athletic coach as well as an alternate for the 1996 Olympic Team in the hammer throw. Murer spent three years in a fascia fellowship program taught by Guy Voyer. He is certified in neuro-functional acupuncture, trained in Sportslab-NYC Fascia Fellowship, certified in Osteopathic joint pumping, and the first practitioner to bring ELDOA to Bloomington, Indiana. According to Murer (Personal Email Interview, 2015) ELDOA is a series of movements designed to create de-coaptation or separation between articular surfaces of a synovial joint (joints with the most mobility, i.e. the ball and

socket). He uses ELDOA and myofascial stretching in his practice to treat many professional, student, and amateur musicians and is one of the few chiropractors that is certified in ELDOA and myofascial work. Throughout his practice, Brian Murer has treated at least twenty musicians, of mixed ages, for physical issues; the most prevalent symptoms amongst them were neck and shoulder pain, numbness, and tendonitis in the joints and upper extremities (similar to research explained earlier). From his work, he has connected themes and correlated that musicians felt pain because they were in a poor general state of health and had a lack of muscle quality necessary to withstand the rigors of performing.

Violinist Alex Kerr was interviewed about his injuries, his students, and how ELDOA has allowed him to extend his performing career. Kerr has been performing the violin for 37 years and started to feel pain at about 17 years of age, but felt serious pain in 2001 after an accident that “exacerbated a congenital spinal stenosis” (Personal Email Interview, 2015). After feeling extreme pain in the neck, he consulted a physician and a physical therapist. Additionally, a surgeon recommended a spinal fusion, and another two surgeons recommended he consult physical therapy because he developed symptoms and weakness. He attributes avoiding surgery to ELDOA because it “kept [him] relatively pain free for the last three years.” As a teacher to collegiate violinists, he tries to engrain in his students “intelligent, deliberate practice, not unconscious numerous hours with regular breaks [as well as] stretching and ELDOA after each practice session with long-term practice plans to overcome the need to quickly intensify practicing last minute.” Importantly, Kerr states, “There is, without a doubt, a stigma attached to injury in the music world. Teachers worry about students admitting pain because it implies their teaching principles are not sound, students are afraid to seek help for fear of disappointing their professor or looking weak in front of their peers and professionals are afraid to open up because

of a fear of losing engagements.” Since Kerr is also concertmaster of the Dallas Symphony, I asked if he hears of injuries in the professional world, and he replied: “Tendinitis, carpal tunnel syndrome, neck pain (herniated discs and reduced spinal curvature), shoulder injuries (rotator cuff), and focal dystonia [are the most frequent].” In his years of teaching he has also worked with students who have playing related injuries, and he suggests that ELDOA should be ingrained in each students’ practice routine.

Summary

While literature exists on the prevalence of injuries, potential risk factors, and injury locations amongst professional orchestras and organizations (Ackermann & Adams, 2004; Lahme, Eibl, Reichl, 2014; Ackermann & Adams (2003); Manchester & Fleider, 1991; Fishbein, Middlestadt, Ottati, & Ellis, 1988; Middlestadt & Fishbein, 1989; Fotiadis, Fotiadou, Kokaridas, & Mylonas, 2013; Paarup, Baelum, Holm, Manniche, & Wedderkopp, 2011; Ackermann, Barrett, & Rickert, 2013), collegiate orchestras (Brandfonbrener, 2009; Williamon, Kreutz, Ginsborg, & Williamon, 2009; Williamon & Thomspen, 2006), and pre-college orchestras (Ranelli, Smith, & Straker, 2008; Britsch, 2005), research is lacking in effective prevention techniques. The research clearly states that injuries are prevalent for all ages (women more-so than men), and factors include the amount of practice time, technique, warm-ups or breaks, but there are limited studies that investigate the effectiveness of a certain method. The main locations that musicians feel pain is the upper extremity, and both physical and instrumental warm-ups are crucial in maintaining a healthy practicing lifestyle. More research is needed on the effects of specific holistic prevention and rehabilitation techniques. This study will examine Guy Voyer’s ELDOA exercise series as a means of promoting musician health and wellness.

CHAPTER III:

Methodology

Context

From the literature, there is a high prevalence of injury among musicians (Cooper, Hamann, and Frost, 2012; Fishbein, Middlestadt, Ottati, Straus, and Ellis, 1988; Horvath 2009; Paull and Harrison, 1997). Therefore, it is important to understand how often musicians practice, if they warm-up, if they maintain good health, where the musicians feel pain, and investigate what they do to alleviate the pain. Using a pre-existing ELDOA class at the Indiana University's Jacobs School of Music, the effects of ELDOA exercises on collegiate level violinists and their perceived pain across a single group pre-test and post-test quasi-experiment were examined.

Participants

The sample from this study included graduate and undergraduate violinists at the Indiana University Jacobs School of Music (JSOM) and was approved by IRB in January, 2015 (See Appendix B). Jona Kerr, director of the ELDOA classes through JSOM Project Jumpstart was contacted to obtain permission to use her classes as part of this study. She accepted this request and allowed the study participants to join in the classes, which were free and open to all JSOM students and ran through each semester.

To recruit participants that were specifically violinists, the researcher emailed all the violin professors at the JSOM asking to forward the researchers' contact information to interested students. Those students that were interested in volunteering to participate contacted the researcher and filled out a consent form. Upon receiving the consent form, the researcher emailed them a link to the pre-survey via Google Surveys. Most of the students that ended up participating were recruited through snowball sampling, since word spread quickly about the

ELDOA classes. Eighteen participants responded and took the pre-survey, but only sixteen completed the entire study. The two students that stopped attending were not counted in the study or results. The only requirement among the participants was that they were full-time students, violinists, and were registered in the JSOM Ensembles (which is mandatory for JSOM masters and undergraduate students). Women represented 75% ($n=12$) and men represented 25% ($n=4$) of the participants. Their ages ranged from 18-23, with an average age of about 20. Subjects represented multiple degree programs including: Bachelor of Music Education ($n=6$), Bachelor Dual Music Education and Performance ($n=1$), Bachelor of Music Violin Performance ($n=5$), Performance Diploma ($n=1$), Bachelor of Science in Music with an Outside Field ($n=1$) and Master of Music in Violin Performance ($n=2$).

All students took one-hour private violin lessons at least once per week and were enrolled in one of six JSOM orchestral ensembles. These orchestras met 3-4 times a week with 2-hour rehearsals per meeting. Rehearsals potentially ran longer during performance weeks or tech-rehearsals during opera or ballet season. At the time of the survey, the students were in pre-assigned orchestras, with the assignments made at the beginning of the school year by audition.

Participants had an average of fifteen years of private study when they took the pre-survey and spent between one and ten hours playing violin in a typical day (which included practicing and ensemble rehearsing). One student described the length of practicing and playing hours per day in the following way: "It depends, but it can get up to eight hours if I have many rehearsals." Participants were asked how many practice sessions they have per day, and the results ranged between one and five sessions, concluding that there was a wide range of practicing and playing hours. Additionally, thirteen of the participants stated that in addition to

orchestra rehearsals, they played for quartets, small ensembles or ad hoc ensembles but the length of time spent with these additional ensembles per week ranged from 6 to 15 hours.

In the pre-survey, general information was gathered about practicing habits, history of injury, set-up, and overall health. Participants also spent between zero and 60 minutes warming up on their instruments per practice session. Participants were asked if they took mental or physical breaks while practicing and one participant took a breaks “every few minutes,” eleven participants took breaks “several times per practice session,” and four participants took breaks “once a session.” The average overall health of the participants was about 4.6, with 0 correlating to “poor health” and 6 “excellent health.” Out of the 16 participants, six did not exercise, and the remaining participants exercised between two and six times per week, spending between 60-90 minutes on exercise per session. Participants were able to select what they had done to relieve any pain they had experienced in the past. Thirteen participants selected that when they feel pain they “Rest/Stop Playing,” seven used over-the-counter medications, seven used the application of ice, six used the application of heat, three used splints or braces, one used physical therapy or massage, five tried yoga, seven tried aerobic exercise, and one used the Feldenkreis method. Additionally, participants marked an average rating of “4” for how comfortable they were with both their shoulder rest and chin rest set-up. In regard to injuries, only three participants had been diagnosed with a repetitive stress injury. Furthermore, only four had attended sessions prior to signing up for the study.

Measure

The researcher-designed pre- and post-surveys (Appendix C and D) were modeled after: Kuorinka, B et al. (1987); Abréu-Ramos and Micheo (2007); Britsch (2005); Cooper, Hamann and Frost (2012); Fishbein, Middlestadt, Ottati, Straus, and Ellis (1988); Guptill and Zaza

(2010); Russell (2006); Russell and Bendetto (2014); and Kreutz, Ginsborg, and Williamon (2009). Jona Kerr, director of the ELDOA program at the JSOM, approved both surveys. Additional fact checks were made by two professors at the JSOM, ensuring the survey's reliability. The sections of the pre- and post-test surveys, listed below in Table 1, were created to address the research questions. The research questions included: do collegiate violinists in the JSOM University setting experience physical pain in relation to playing their instrument and where?; did perceived pain change or remain the same as students participated in ELDOA sessions?; and what are the physical, mental, and emotional benefits of ELDOA?

Table 1

Pre and Post-Survey Design

Pre-Survey	Post-Survey
Section I: General Demographics	Section I: Practicing/Playing Information
Section II: Practicing/Rehearsal Information	Section II: Overall Health and Experiences with Pain or Discomfort
Section III: Instrument Set-Up	Section III: Location of Pain or Discomfort
Section IV: General Health	Section IV: Response to ELDOA
Sections V: Discomfort or Pain	Section V: ELDOA

Procedure

Letters inviting participants were sent out by the researcher to the individual violin professors to ask if they could forward researcher contact information to their students (see Appendix A). Three professors responded and confirmed that they would forward the information. The convenience sample quickly turned into snowball sampling as word traveled about this study. The students that showed interest contacted the researcher via email. Upon

confirming that the students wanted to participate in the study, consent forms were sent. Once the consent forms were received, a pre-survey, designed using Google Surveys, was sent to participants' IU email addresses. Participants could withdraw from the study at any time. In order to complete the study, the participants were asked to attend a minimum of eight ELDOA classes throughout the spring semester. Attendance at each class was kept by the researcher via a Microsoft EXCEL spreadsheet. Classes were held every Tuesday and Thursday and lasted between 45-60 minutes. If the students had to leave early from a class, they had to state why. This only happened about three times, and for each time it was due to a rehearsal and the students only left about 10 minutes before the end of the class. Once they completed the minimum of eight sessions the participants were emailed a post-survey to complete.

The Class

Each class, held on Tuesdays and Thursdays throughout the semester, was led by Jona Kerr. Exercise mats were provided. Participants were asked to remove socks and shoes and the class began with a standing four-part dynamic warm-up before moving through the ELDOA postures/exercises/movements. The first warm-up was a gentle non-impact warm-up with enough motion to mobilize various joint articulations. Participants began with rolling the feet and gradually bringing them to a march, keeping the thighs parallel to the floor. As students continued to march in place, Jona instructed the students to add arm movements in a sequential order while continuing to march in place: first pumping the arms out in front of the body parallel to floor, adding the movement in which the arms reach out to the sides of the body (left arm out left, right arm out right), and then up so that the arms were in line with the ears; these three movements were done continuously for about one minute. This arm movement (while still marching) was isolated to just pumping the arms up. The second warm-up required rocking the

sagittal plane (pelvis), addressing the anterior and posterior sections of the lower back and pelvis. The third set of warm-ups included spinal translations and side bends, which work the center of the lumbar spine with a four-point mixture of translating and side bending. The side bending was done by first isolating the left side, then the right before combining together. The last warm-ups were shoulder girdle exercises that required the participants to feel and create space in the glenohumeral joints.

Each class contained the same ELDOA exercises, but Jona Kerr added myofascial and additional yoga-like stretches depending on where participants of the class felt the most pain or discomfort, which she asked about prior to the start of class. The main ELDOAs that were completed in class were done in a progressive fashion in order to break the process down and help students isolate certain sections of the body. The main ELDOAs completed during each class are classified as: C4/C5, T6/T7, T8/T9, and L5/S1 and were done in no particular order. The classifications, are a shorthand for targeted vertebrae of the cervical (C1-7), thoracic (T1-12), and lumbar (L1-5) areas of the spine (see Appendix C).

CHAPTER IV:

Results

The results of the pre- and post-test were analyzed and organized based off of the original research questions:

1. Do collegiate violinists in the JSOM University setting experience physical pain in relation to playing their instrument? Where?
2. Did perceived pain decrease or increase as students participate in ELDOA sessions?
3. Are there physical, mental, and emotional benefits of ELDOA?

All participants had to fill out a pre-survey, participate in a minimum of eight sessions of ELDOA classes with Jona Kerr, and upon completion were asked to fill out a post-survey. The entire pre- and post-survey questions are included in the Appendix, yet most of the questions ended up not being needed in order to defend the importance and necessity of ELDOA. The questions omitted were asking for the participants' private teachers, and what orchestra they had been rehearsing with.

Research Question One: Do collegiate violinists in the JSOM University setting experience physical pain in relation to playing their instruments? Where do they feel pain?

Multiple questions were asked in the pre-survey and post-survey that investigated if the participants felt pain, where they felt pain, and how often. Additionally, participants had to rate if they had any experience of discomfort or pain three to four weeks prior to filling out the survey, if they had to stop playing due to pain, and if they had recurring pain.

In the pre-survey, participants were asked, "Do you feel pain or discomfort in relation to your instrument?" and 12.5% ($n=2$) of the participants said "no," they did not feel pain or discomfort, 12.5% ($n=2$) said "yes," they did feel pain or discomfort, and 75% ($n=12$) said that

they “sometimes” feel pain or discomfort. In the post-survey, the numbers remained the same, but for some participants, the individual answers changed, meaning one participant might have put “yes” in the pre-survey, but put “sometimes” or “no” in the post-survey.

In the pre- and post-survey, multiple choice questions were asked to evaluate and rate the perceived pain that the participants were feeling 3-4 weeks prior the survey, either while they played the violin or after which is exemplified in Table 2. For the pre-survey, the purpose of the time frame of 3-4 weeks was to get a general overview of perceived pain instead of how they felt at the exact moment when they filled out the survey. In the post-survey the same question was asked, but the time frame changed to the past 2 months to represent the time spent taking the ELDOA class. The first question asked to rate any pain that they felt *while* playing the violin. In the pre-survey, the mean pain severity rating was 3.31, and the post-survey pain severity rating was a mean of 2.87. The second question asked to rate their perceived pain *after* they play the violin, again 3-4 weeks prior to filling out the survey. The mean severity rating was 3.25 in the pre-survey and it decreased to 2.87 in the post-survey.

Table 2

Pain while playing and after playing in pre- and post- survey

	Pre Survey				Post-Survey			
	Mean	Mode	SD	Sk	Mean	Mode	SD	Sk
In the past 3-4 weeks, rate any discomfort or pain that you experience while playing the violin.	3.31	2	1.49	0.20	2.87	2	1.20	1.57
In the past 3-4 weeks, rate any discomfort or pain that you experience after playing?	3.25	5	1.48	-0.35	2.87	2	1.51	0.51

Additionally, participants were required to document the location and rate the pain that they felt within the three to four weeks prior to participating in the study, similar to Russell and Bendetto (2014), and Kreutz, Ginsborg, and Williamon (2008). The reasoning was to find out if participants felt recent pain or discomfort as close to the start of the study as possible.

Participants were asked to rate their perceived pain on a scale between zero (no discomfort) and six (extreme discomfort). For the purpose of scoring the results, the numbers were changed to 1 (no discomfort) and seven (extreme discomfort). Interestingly, individual participants' responses varied quite significantly. In tables 3 and 4, the mean of pain severity is listed by body part and in tables 5 and 6, and the pain severity is presented based on severity. The cut-off for the severity was a mean rating of "2," therefore, any mean below 2 was not considered high severity. In the right side of the body, the shoulder, neck, upper back, middle back, and forearm had the highest pain severity. On the left side of the body, the neck, hand, upper back, middle back, and lower back had the highest pain severity ratings.

Table 3

Pain in pre and post- survey (left side)

	Pre Survey				Post-Survey			
	Mean	Mode	SD	Sk	Mean	Mode	SD	Sk
Left hand	2	1	1.366	1.433	1.562	1	1.263	3.241
Left palm	1.875	1	1.360	1.708	1.625	1	1.258	3.119
Left fingers	1.625	1	1.087	2.297	1.625	1	1.087	2.297
Left wrist	1.437	1	1.093	2.803	1.937	1	1.388	1.832
Left forearm	1.75	1	0.856	0.545	2	1	1.211	1.286
Left elbow	1.25	1	0.577	2.375	1.25	1	0.774	3.442
Left shoulder	2.875	1	2.028	0.412	2.8125	1	2.040	0.719
Left neck	2.937	2	1.768	0.437	2.625	2	1.746	0.834
Left jaw	1.562	1	1.093	2.440	1.687	1	1.078	1.448
left upper back	2.5	1	2	0.857	2.375	1	1.543	0.889
Left middle back	2.062	1	1.481	1.143	1.687	1	1.352	2.501
Left lower back	2.062	1	1.340	1.771	1.5	1	1.264	3.388
Left hip	1	1	-	-	1	1	-	-

Table 4

Pain in pre and post- survey (right side)

	Pre Survey				Post-Survey			
	Mean	Mode	SD	Sk	Mean	Mode	SD	Sk
Right hand	1.625	1	1.025	1.314	1.25	1	0.577	2.375
Right palm	1.625	1	1.310	2.839	1.25	1	0.774	3.442
Right fingers	1.375	1	0.619	1.504	1.187	1	.543	3.029
Right wrist	1.812	1	1.167	0.986	1.375	1	0.718	1.731
Right forearm	2.125	1	1.204	1.039	1.562	1	0.963	1.585
Right elbow	1.25	1	0.577	2.375	1.25	1	0.447	1.277
Right shoulder	2.625	1	1.543	0.229	2.187	1	1.600	1.323
Right neck	2.562	1	1.711	0.608	1.875	1	1.408	1.559
Right jaw	1.437	1	0.892	2.145	1.25	1	0.774	3.44
Right upper back	2.312	1	1.778	1.00	2	1	1.366	1.792
Right middle back	2	1	1.264	1.129	1.625	1	1.087	2.297
Right lower back	2.125	1	1.360	1.561	1.375	1	0.718	1.731
Right hip	1.062	1	0.25	4	1	1	-	-

Table 5

Severity ratings: Left side of body

Location	Pre-Survey Mean	Post-Survey Mean
Left neck	2.937	2.625
Left shoulder	2.875	2.8125
Left upper back	2.5	2.375
Left middle back	2.062	1.687
Left lower back	2.062	1.56
Left hand	2	1.562
Left palm	1.875	1.625
Left forearm	1.75	2
Left fingers	1.625	1.625
Left jaw	1.562	1.687
Left wrist	1.437	1.937
Left elbow	1.25	1.25
Left hip	1	1

Table 6

Severity ratings: Right side of body

Location	Pre-Survey Mean	Post-Survey Mean
Right shoulder	2.625	2.187
Right neck	2.562	1.875
Right upper back	2.312	2
Right lower back	2.125	1.375
Right forearm	2.125	1.562
Right middle back	2	1.625
Right wrist	1.812	1.375
Right hand	1.625	1.25
Right palm	1.625	1.25
Right jaw	1.437	1.25
Right fingers	1.375	1.187
Right elbow	1.25	1.25
Right hip	1.062	1

Research Question Two: Did perceived pain decrease or increase as students participated in ELDOA sessions?

In the pre- and post-survey, participants were asked if they had to stop playing the violin due to sharp pain or discomfort in the body. In the pre-survey, 13 participants (81.25%) did not have to stop playing and 3 (18.75%) did stop playing due to pain. In the post-survey, 10 participants (62.5%) did not have to stop, 2 (12.5%) did stop, and 4 (25%) participants selected “sometimes.” Only one participant selected “no” in the pre-survey and “yes” in the post-survey. Every other participant differed from the pre-survey in that their answer did not change between the pre- and post-survey, or it changed to “sometimes” in the post-survey. It is interesting to note that the pain might not have decreased significantly, but some individuals did feel a change between the pre- and post-survey or at least were more aware of an increase or decrease of pain.

When asked to rate the severity of pain felt in the upper and lower parts of the body, certain parts decreased substantially between the pre- and post-survey (see tables 3, 4, 5, and 6). For the right side of the body, ratings for 12 locations decreased, zero increased, and one remained the same. For the left side, seven locations decreased, three increased, and three remained the same. Even though the pain on the left side was higher in severity than the pain on the right side, the participants felt more decrease in pain on the right side of the body compared to the left side of the body. On the left side of the body, the neck, shoulder, upper back, middle back, lower back, and hand had the highest ratings of severity. The right side of the body had the highest severity ratings for the shoulder, neck, upper back, lower back, forearm, and middle back. The right side had the highest severity ratings with the most significant decrease in pain between the pre-and post-survey. Interestingly, the hand and forearm were the only parts of the body that did not have the highest severity for both sides. For the left side of the body, some

areas increased in pain severity, whereas the right side did not have any increase in severity. The left forearm, jaw, and wrist increased in pain for participants, although, only the wrist had a most significant increase from 1.437 to 1.937. The right elbow, left elbow, left hip, and left fingers had a mean of pain severity that remained the same from the pre- to the post-survey.

For the question that asked participants to evaluate the pain they felt *while* playing, 8 participant's pain severity ratings decreased, four increased by one severity level, and 4 remained the same. For the pain they felt *after*, pain decreased for six people, increased for three, and remained the same for seven participants. In the pre-survey, participants were asked if they "had experienced lack of control, neck or shoulder pain or other symptoms that prohibit from playing their instrument in the past months," to which eight replied yes and eighth replied no. In the post-survey, however, two said yes, ten said no, and only four said sometimes. Therefore, the six participants that felt those symptoms changed their answers to either "no" or "sometimes" meaning that perceived pain either lessened in severity and frequency or did not happen at all. Participants were also asked to provide an open-ended description of whether they noticed any changes since participating in ELDOA. In response to that question, all sixteen participants responded and explained or described the changes that they felt. Those changes were categorized as physical, mental, and emotional changes and are discussed in detail later in this chapter.

Research Question Three: Are there physical, mental, and emotional benefits of ELDOA?

In the pre-survey, participants were asked to identify if they had experienced physical, emotional, and mental discomfort or issues as a direct result of playing their instrument. Table 7 shows the frequency of the choices in the pre-survey. Participants could select as many symptoms as they had experienced as a direct result in playing their instrument.

Table 7

Symptoms pre-survey

Symptoms	Frequency (Pre-ELDOA)
Anxiety	11
Depression	8
Sleep Disturbances	2
Stage Fright	11
Performance Anxiety	12
TMJ	0

In the pre-survey, participants identified experiencing anxiety, depression, sleep disturbances, stage fright, and performance anxiety. In the post-survey, participants were asked if they had noticed any changes since starting ELDOA, and were given the same list of possible risk factors. In the post-survey, one participant noticed a change in “TMJ Syndrome (a temporomandibular joint disorder),” three selected “anxiety,” one selected “depression,” two selected “stage fright,” three selected “performance anxiety,” and two selected changes in “sleep disturbances.”

Participants were also given the opportunity to respond freely to elaborate on those changes and in regards to anxiety, stage fright, and performance anxiety four students commented and elaborated. Each felt, on some level, a decrease or lessening of those disorders. To elaborate, one participant documented “ELDOA has made me feel more physically warmed up and prepared for my performances resulting in a decrease of performance-induced anxiety and stage fright.” Another added:

I also have been performing in my studio masterclass nearly every week, and (compared to past semesters) I feel much less nervous and scared to play for others. I am able to calm myself down when I do get nervous and play past the nervousness.

On the other hand, a different participant observed that she felt a change in anxiety, but that it had increased. She wrote, “I think that because I have become more aware of my body through ELDOA, I have been more anxious because of the pain that I’m noticing more than I did before.” Therefore, one participant noticed that her anxiety amplified with her growing awareness of the perceived pain in their body.

In addition to a lessening or increasing of anxiety and nerves, one student elaborated, “I feel that I am able to manage any of the physical anxiety symptoms I experience. Especially when it comes to tightness in my stomach and chest.” Additionally, one student added “I think my overall levels of performance anxiety/stage fright have lessened after I do ELDOA, because I feel a lot looser and more confident.” In conclusion, ELDOA had some effect on participant’s anxiety.

In regard to sleep disorders, only two students claimed that ELDOA has improved their sleep. No participant mentioned that their sleep patterns worsened after ELDOA. One of those participants observed that they slept more deeply by stating, “Since starting [ELDOA] I noticed that after each time of doing the ELDOA class, I sleep so soundly. I don’t wake up at all during the night and feel very well rested.” Furthermore, one participant elaborated on how ELDOA had helped her depression by stating, “I definitely noticed that I feel happier after ELDOA classes, as I suffer from depression regularly.”

Participants were asked to answer other open-ended questions in order to accurately gauge their experiences with perceived pain before the ELDOA classes compared to after the

ELDOA classes. For all three questions, every participant wrote their experiences, thoughts, or observations in regards to the changes that they observed as they went through the eight classes of ELDOA. In the post-survey, 100% of the participants wrote that they felt an improvement in their physical, mental, and emotional health after attending ELDOA.

Out of 16 responses to the question, “How do you feel physically after ELDOA?” one student described the physical changes and compared it to a workout session at a gym,

After the classes, I felt like I just did an hour-long work out at the gym. I was sweaty and tired, but it felt good and felt like I accomplished something. I also noticed that I felt very relaxed after each session and definitely more relaxed than I did last semester.

From the 16 responses, the most common comments surrounded the idea of being exhausted, relaxed, and tension-free. One student wrote that physically he or she felt:

Absolutely great! Going to ELDOA especially after long orchestra rehearsals was a physical reliever. It basically undid all the tension that was caused in orchestra. I am more aware of my posture. I can control muscles that I really was not aware that I could control. Now, after ELDOA, I find that if I feel tense in my practice, I can almost pinpoint where it is coming from and adjust accordingly.

Another student described where he or she felt physical discomfort and how ELDOA helped:

I felt the decreasing frequency of encountering pain and discomfort in my body since participating in ELDOA. I used to have some pain in my shoulder and upper back, but after ELDOA they got more relaxed, plus that opened up more so that problem was not as serious as before.

Overall, after a minimum of eight weeks of ELDOA, participants noted having physical changes between the pre- and post-survey. Seven participants responded that they felt that their

posture was improved (reporting on changes in spinal awareness and alignment), seven participants noticed a greater range of motion, seven had increased flexibility of the spine and other parts of the body, and four commented on their awareness of the ‘chin-in’ concept. Every participant made a comment on a change that they noticed after participating in ELDOA. For postural awareness, one student sums it up quite nicely by commenting:

I have experienced a greater range of motion and control of my shoulders and back muscles. I also noticed that I am much more flexible in my wrists. ELDOA has made me more aware of my posture and spinal alignment, especially in the extreme lower back and the neck.

Seven participants wrote about having more flexibility and mobility. The participants mentioned that their “hands and fingers can stretch further,” and that they “noticed less pain in the left side of my back, more mobility in my arms and legs, and greater sense of relaxation.” One participant added that “From a physical perspective, I have experienced a greater ease of playing due to an increased range of motion.”

Continuing with posture, the chin-in concept is crucial to ELDOA and the alignment of the spine and body. In order to achieve the chin-in concept, the chin is pushed straight back in order to achieve a lengthened cervical spine. One question in the post-survey simply asked participants, “Explain any changes that you noticed since participating in ELDOA,” and six of the participants mentioned how they focused on the “chin-in.” After participating in the classes, students wrote how they adjust their posture by keeping their chin-in as exemplified by one participant’s description of changes they observed after completing the ELDOA classes,

I think the most prominent changes are the awareness of my neck and back. I have never known how important and crucial it is related to my body condition until I start ELDOA.

My chin used to pop out and my neck was not straight. Now, I always keep my chin in and to make my spine straight, and keep my lower back in line with upper back to have a nice support of my weight. After starting ELDOA, I seldom or rarely have back soreness or neck pain. It is amazing. Just little tiny adjustment of posture makes big difference!

Another participant added, “I notice when my chin is pushed out and can click my head back into a position closer to the ‘chin in from’ ELDOA.” The physical changes from practicing ELDOA not only included keeping the chin-in, but 100% of the participants noticed a physical change in their bodies and postural alignment from practicing ELDOA.

In addition to the physical changes, participants also felt emotional and mental benefits. For the free-response question asked, “How did you feel mentally after ELDOA?” all 16 responded and explained the mental changes they experienced. Only one participant stated, “It hasn’t really affected me mentally” and another wrote, “usually somewhat better.” The other 14 students that felt changes in their mental state from practicing ELDOA mentioned that they felt less stressed, calm, and “refreshed mentally.” A participant describes the feeling of being, “Rejuvenated. I always feel like I am more productive after I do cardio exercise and I feel this same way after I do ELDOA.” Another student remarked that it felt “like I am making a positive change to my body.” Mentally, participants claimed that they felt relaxed, refreshed, calm, relieved of stress, happy, peaceful, empowered, and that they left the class in a better mood than they had come in with. Out of the 15 participants who commented on how ELDOA effected them mentally, two participants commented that after practicing ELDOA, they felt, “refreshed mentally and ready to take on the next day’s task,” and “mentally refreshed and less stressed.” Another wrote:

The physical relaxation also translates into mental and emotional relaxation. I love ending with the feet against the wall and back on the ground stretch [L5/S1] because all the blood rushes to different parts of the body and it has a very calming effect.

Other themes of “zen,” “calmness,” and “relaxation,” were common throughout the free responses. A participant elaborated that they felt “calmness every time after doing ELDOA and I think reminding myself of that did help me relax mentally.”

Participant answers about the effects of ELDOA on their emotional health included, “calmer, at peace,” “happy,” “proud of myself,” and “relieved of stress.” One student wrote, “Kind of similar to the above statement [mental], I feel a lot less anxiety after completing an ELDOA class.” Another wrote: “Emotionally I felt much better and more relaxed. The impact these exercises had on my emotional state was surprising.” On the other hand, two students felt frustrated because they could not do the exercises without getting exhausted, and sometimes did not feel as good as they had hoped. Two students explained that the pain would leave certain parts and move to different areas of the body, and for them that was disappointing. One student elaborated by stating that they sometimes felt, “frustrated because the exercises can be challenging. When I do the exercises sometimes I feel like I have tension in other areas.” Another participant expressed the same idea, but stated that the pain would subside after doing ELDOA:

When I had to take a week off of the exercises I noticed new tensions and pains that I had never noticed before. Once I returned to the class the pain went away and I can only understand this as me being unaware of the discomfort before it was relieved by the ELDOA and then when the pain returned I actually could feel it because it was new pain.

Overall, the participants experienced some sort of effect on their mental, emotional, and physical state. The most common words used to describe how ELDOA affected their mental and emotional state were calm, peaceful, and relaxed, concluding that ELDOA effects musicians' perception of pain and effects them physically, mentally, and emotionally.

CHAPTER V:

Discussion, Implications, Limitations, and Suggestions for Future Research

The purpose of this study was to explore the effects of ELDOA on violinists' perception of pain and to explore the physical, mental, and emotional effects that ELDOA has on musicians. The findings showed that the participants felt the highest pain in both the left side and the right side of the body, more specifically the upper extremities and upper body. A higher prevalence, or higher severity of pain before ELDOA was found in the left hand, left forearm, left shoulder, left neck, left back (lower, middle, and upper), right hand, right forearm, right shoulder, right neck, and all areas of the back (but more frequently in the upper and middle). In the pre-survey, the left neck was rated higher than the right neck, and the left shoulder was higher than the right shoulder, however, by the end of the ELDOA classes, there was a greater decrease in pain the right side of the body compared to the left. Overall, the individual severity ratings varied between the participants. On average, the left side of the body, the neck, shoulder, back, and hand had the highest pain severity ratings. The most severely rated regions of the right side of the body included the shoulder, neck, upper, and middle back. This is consistent with the findings of Manchester & Fleider (1991) who observed hand, wrist, arm, and shoulder injuries in music students as well, although pain severity in the fingers for the current study were not as prominent.

Research question one inquired whether violinists in the JSOM University setting experienced physical pain in relation to playing their instrument. The results suggest that students did feel pain and discomfort in certain areas of the body. The findings of this study differ from Lahme, Eibl, and Reichl (2014) which found no difference of pain between the left and right sides of the body however the pain was more prevalent in the upper body in both

studies. Similar to my study, Fishbein, Middlestadt, Ottati, Straus, and Ellis (1988) and Fishbein and Middlestadt (1989) found a higher prevalence of pain in the shoulder, back, neck, and hands as well as a higher prevalence of pain the upper body in comparison to the lower body.

According to Brandfonbrener (2009), Kreutz, Ginsborg, and Williamon (2009) and Williamon and Thomspen (2006), collegiate students feel pain and discomfort when playing their instruments, which is consistent with the current study in that violinists of the JSOM do feel some pain or discomfort.

The purpose of research question two was to ascertain if the perceived pain changed or remained the same as students participated in ELDOA sessions. When investigating pain severity ratings, pain was rated higher on the left side than the right, but the left neck in the pre-study had the highest rating with a mean of 2.937 in the pre-survey and 2.625 in the post survey (about a 10% change). The largest decrease in pain between the pre- and post-survey was the left lower back (37.5%). On the other hand, there was an increase for the forearm (12.5%), jaw (7.4%), and wrist (25%). This could be attributed to a greater awareness of the body, or a sudden increase in practicing, as discussed as a limitation. The left elbow and left hip remained about the same with a severity mean of 1.25 and 1. On the right side of the body, the right shoulder had the highest mean with 2.625 in the pre-survey and 2.187 in the post-survey, a decrease of about 16.6%, but the middle back had the highest decrease by 35.2%. The right elbow was the only part of the body where the pain severity remained the same between the pre- and post- survey. When asked for specific experiences with pain or discomfort after participating in ELDOA, the participants all noticed that some or all of their pain either dissipated or was completely eliminated. Cooper, Hamann, and Frost (2013) used a control and treatment group to investigate if warm-ups and stretches affected perceived pain and the current study draws upon the idea that stretches or

exercises can effect perceived pain. The current study takes Cooper, Hamann, & Frost's (2013) study a step further to actually look into how certain movements can effect perceived pain. Research question three pertained to whether participants experienced any physical, emotional, or mental changes after practicing ELDOA. Common responses in the post-survey in regards to their mental, physical, and emotional well-being include feeling calmer and less stressed. Some participants also noticed a change in their levels of performance anxiety, stage freight, and overall mental anxiety. Some study participants indicated that there were physical symptoms or changes after participating in ELDOA such as posture, flexibility, mobility, and greater range of motion. Mentally, participants noticed a difference in stress, anxiety, sleep patterns, as well as performance anxiety. Therefore, it is important to acknowledge that some of the participants observed physical, emotional, and mental benefits from participating in ELDOA, and some did not feel as much emotional or mental benefits as others. Kreutz, Ginsborg, and Williamon (2009), who investigated the health behaviors of musicians as well as the emotional state of conservatory students, found that students' perceived quality of performance increased when they felt less pain. This is similar to the current study because the participants felt a positive change to their mental and emotional state of well-being and some felt it helped with their practicing and performing. By looking into how ELDOA affects mental and emotional health, this current study addresses exactly how it affected participants. This current study takes Ackerman, Barrett, and Rickert's (2013) study a step further to find out if there was a correlation between ELDOA, injury, mental, emotional, or physical changes.

Additional Observations

Some additional observations appeared throughout the study's pre- and post-survey that were not initially part of the research, but ended up being quite important when investigating the

effects of ELDOA on collegiate violinists. These observations were that participants began to change how they practiced by taking more breaks and adding physical warm-ups to their practice sessions.

In the pre-survey, they were asked to state how long they spent on warm-up activities, and the number of minutes ranged from zero to one hour. The definition of “warm-ups” in both surveys was left up to the interpretation of the participant. In the pre-survey, two clarified and stated, “No physical warm-ups,” coming to the conclusion that they might have interpreted it as warm-ups on the instrument rather than physical warm-ups. In the post-survey, they were asked if they warmed up on the violin, if they were consistent with warm ups, and what those warm-ups consisted of. Fourteen responded that they do warm up and two responded “sometimes.” When asked if they were consistent with warm-ups, 12 said yes and four said no, however, when asked, “If YES, what does that warm-up consist of” 14 participants responded and explained what they do to warm-up. In the post-survey, all fourteen participants explained that in their practicing, they added one or more of the ELDOA class warm-ups or ELDOAs. One participant remarked that their warm-up routine included, “Basic ELDOA arm stretch (arms extended, shoulders down, wrists cocked back and fingers extended” and other stated, “Since starting ELDOA I have started using the same warm-ups with marching in place and moving arms in and out/up and down/front and side.” Thus, an observation between the pre- and post-survey is that participants changed their view and interpretation of warm-ups.

Over the semester, participants started to include ELDOA warm-ups and exercises into their own practicing routine. Ten participants stated they included some of the ELDOAs and ELDOA class warm-ups into their practicing schedule and were able to practice longer periods of time without any major issues or discomfort. Five participants did observe changes in their

practicing and four participants noticed that they could practice longer without feeling pain. Therefore, an interesting outcome of ELDOA is that some participants felt that they could extend their practicing time.

Additionally, the most common response or description of the changes made to their practicing routines was that some participants ($n=2$) took more breaks when practicing. They acknowledged that it could be an increase of awareness. One participant explained:

I take more breaks now to release tension through exercises and stretching. I think the biggest factor is just my increased awareness. In the past I would simply ignore aches and pains as they showed up in my practicing and push through until they became unbearable. Now I pay much more attention.

From the results in the pre-survey in comparison to the post-survey, one can notice the changes in their definition of “warm-ups,” and “practicing.” When asked to describe the changes in their practicing since ELDOA, ten participants explained that they did in fact feel changes. One said,

Whenever I feel tense while playing or any part of my body starts to hurt, I take a break and do some stretches and exercises to undo the damage that I have caused. This has definitely helped me feel better during my practicing.

Changes in practicing habits were difficult to gauge, but the participant responses clearly state that ELDOA had some effect on the participants’ views and reflections on their own practicing, due to the fact that when they feel fatigued or tired they started to add warm-ups, stretches, and ELDOAs to their routines. In regard to overall health, four participants rated their overall health higher in the post-survey, one participant’s overall health decreased by one rating, and eleven ratings remained the same. Lastly, according to Zetterberg, Backlund, Karlsson, Wener, and Olsson, (1998) change of set-up can be used as a prevention technique to injury. In the post-

survey, participants were asked if they had changed their set-up since beginning the ELDOA classes. Seven participants mentioned that they either changed their set-up or became more aware of how they set their instrument in relation to their body with five of the participants noting that they adjust the position of their head as they play.

Similar to the current research, Cooper, Hamann, and Frost (2012) discussed the importance of warm-ups for musicians, Russell (2006) attempted to find out if warm-ups impacted perceived pain, while Russell and Bendetto (2014) argued for the importance of warm-ups for musicians' health. The current study supports the need for warm-ups on the instrument as well as physical warm-ups; the ELDOA exercise routine in the class included physical warm-ups as well as a general Voyer warm-up. Little previous research focused on a prescribed set of exercises that helped participants feel physically better but Cooper, Hamann, and Frost, (2012) found that their treatment group in their study that did the physical warm-ups felt less pain than the control group, which is consistent with the current study. Russell (2006) attempted to provide research about warm-ups and how they could potentially help pain decrease, but did not give the participants the tools to actually learn and practice the stretches; he just analyzed those who already did warm-ups and those who did not. The ELDOA class that Jona Kerr leads is specifically designed for music students at the JSOM and uses warm-ups and cool-downs in the session. Therefore, the ELDOA class gives the tools necessary for participants to do on their own.

This study supports current researchers Fishbein, Middlestadt, Ottati, Strauss, & Ellis (1988); Middlestadt & Fishbein (1989); Paarup, Baelum, Holm, Manniche, & Wedderkopp (2011); Fotiadis, Fotiadou, Kokaridas, & Mylonas (2013); Abr  u-Ramos & Micheo (2007) in that injuries are prevalent for musicians and the upper body is the most frequently affected. Some

studies found that children are prone to injury as well, suggesting that prevention techniques could be introduced at an early age and not when students reach a higher level of technique (Ranelli, Smith, and Straker, 2008; Britsch, 2005). In regard to collegiate settings, researchers Brandfonbrener (2009); Kreutz, Ginsborg, & Williamon (2009); and Williamon and Thomspson (2006) investigated the prevalence of injuries for university-aged students. The current study does support the fact that there is a prevalence of injury among collegiate students. Ackermann, Barret, & Rickert (2013) drew emotional and mental stressors into research in relation to physical injuries, and this current study addresses the benefits of ELDOA and the impact it has on not just physical health but mental and emotional health.

This current study found that ELDOA effected perceived pain in the upper body, predominately more on the left side than the right. The study found that ELDOA had physical, mental, and emotional effects on the participant's perception of pain. Additionally, the study found that participants changed their practicing routines to include more breaks, warm-ups, and exercises (Cooper et al., 2012; Russell, 2006; Russell and Bendetto, 2014). ELDOA incorporates warming up into the exercise routine, and many of the participants in this study reflected on how they incorporated those warm-ups into their daily practice. Overall, ELDOA had a predominately positive impact on the participants in that it helped them become more aware of pain, posture, and their body in relation to their instrument.

The research on ELDOA is extremely limited, yet this exercise series could potentially reduce the risk of injury among musicians. Plenty of research exists on the prevalence of injuries, the location of injuries, and the fact that students do not warm up or stretch as much as they should. ELDOA has the potential to benefit some musicians, and more research is needed.

Limitations

Throughout the study, limitations came up that might have affected the outcome. The timing of the study itself was not long enough for a full evaluation of the effects of ELDOA on the collegiate violinists and therefore, the time frame of when the study took place must be taken into consideration. The pre-survey was taken right after winter recess and many of the students were just getting back into playing from being on holiday break. The post-survey was given at the end of the semester when many students had recitals, performances, hearings, and juries and were practicing more than they would have been at the start of a semester. Additionally, participation varied across subjects. Some participants came to class twice a week, and finished the required classes in two months while other participants came every other week. Therefore, it is more likely that those who came twice a week would feel the benefits of ELDOA more frequently than those who spread the classes out over the spring semester. Another limitation was that the classes were only held at one time, twice a week. Perhaps if there were more times (if space was available) the participants would have been able to attend more frequently.

Limitations regarding bias could be addressed if this study were to be replicated. By having others administer the procedures, especially in regards to the post-survey free response interviews, bias could be eliminated. Perhaps having a control and experimental group would provide more evidence on the effects of ELDOA. Even comparing ELDOA to other holistic alternatives such as Alexander Technique or yoga, would provide a comparison on the effects. Additionally, a larger sample size would provide more information about how ELDOA affects musicians. A suggestion for reliability checks on the data for the open-ended questions would contribute to the elimination of potential bias.

Implications for Pedagogy

This research explored the effects of ELDOA on violinists, yet this could be done with any instrumentalist or athlete. Perhaps more light can be shed on different effects of ELDOA if different musicians (such as all strings, vocalists, woodwind players, percussionists, or pianists) would have participated. Having a wider range of musicians might have affected the outcome for location of pain and would have given a different insight into the repetitive motions that the respective musicians do on a daily basis.

For large group instruction (i.e. public school teaching) many teachers avoid warm ups, breaks, and stretches due to the time constraints on rehearsals. They have limited time to prepare for contests, competitions, concerts, and other requirements made by the state or district. It is imperative that teachers educate their young students on how their overall health affects their performance and well-being. Teachers should include warm-ups, breaks, and cool-downs in their daily lesson planning to help educate their students and to prevent injuries from occurring. Teachers should participate in the ELDOA trainings offered yearly through different ELDOA organizations to become certified in ELDOA which would help teachers increase their own body awareness in relation to their instrument. If teachers are certified in ELDOA they might be more confident and likely to apply it to their own classrooms. If not certified, even the warm-ups done in the JSOM ELDOA class would make a difference in the health of musicians. If students at a young age learn about their bodies in relation to their instrument and increase body awareness, the likelihood of being injured later on might decrease. Additionally, students that practice ELDOA every day in rehearsal might begin to practice it on their own at home and create the habit, especially if they start to feel the positive effects. Injury prevention is important and this

study suggests that ELDOA can assist in prevention and rehabilitation of musician injury not just of collegiate students, but musicians of all ages as well as athletes.

Recommendations for Further Research

Many recommendations can be made from this study: using a wider range of participants, adding more focus to the before and after effects of ELDOA using visual representation, and introducing more prevention and rehabilitation techniques into the collegiate environment.

The participants for this current study were violinists. Working with a wider range of instrumentalists could potentially help expand this study and make it more relevant to all musicians. Investigating how ELDOA effects different instrumentalists might prove that it is for everyone, not just collegiate violinists. In addition, widening the participant age range to include all ages might provide a comparison between the younger musicians and older musicians and how ELDOA effects them. In general, more academic literature is needed on the effects of different rehabilitation techniques like ELDOA and their effects on musicians.

Furthermore, a suggestion for future research involve alternative data collection methods. The researcher-designed surveys provided useful to understand the effects of ELDOA. To provide another viewpoint of the effects of ELDOA, the researcher suggests that pictures be taken of the participants doing the ELDOAs, on the first class and then on the last class, in order to visualize the changes. Perhaps if the participants saw a visual of themselves doing ELDOA, they might see the visual changes happening. Lastly, the current study did not allow alternate times. Creating more classes to reach and accommodate more students would allow more students to experience the benefits of ELDOA.

The purpose of this study was to explore the effects of Guy Voyer's exercise series ELDOA, and to understand how it affects the musicians' physical, emotional, and mental health and

awareness of their perceived pain. Knowledge of ELDOA and additional warm-ups, stretches, and cool-downs is beneficial to all teachers and students. Implementing ELDOA into rehearsal settings for musicians of all ages might prevent injury and rehabilitate those whose injuries prevent them from performing at a high level.

REFERENCES

- Abreu Ramos, A. M., & Micheo, W. F. (2007). Lifetime prevalence of upper-body musculoskeletal problems in a professional-level symphony orchestra. *Medical Problems of Performing Artists*, 22(3), 97-104.
- Abréu-Ramon, A.M., & Micheo, W.F. (2007). Lifetime prevalence of upper-body musculoskeletal problems in a professional-level symphony orchestra. *American Journal of Public Health*, 91(9). p. 1380-1382.
- Ackermann, B. J., & ADAMS, R. D. (2004). Perceptions of causes of performance-related injuries by music health experts and injured violinists. *Perceptual and Motor Skills*, 99(2), 669-678. doi: 10.2466/PMS.99.6.669-678
- Bejjani, F. J., Kaye, G. M., & Benham, M. (1996). Musculoskeletal and neuromuscular conditions of instrumental musicians. *Archives of Physical Medicine and Rehabilitation*, 77(4), 406-413.
- Brandfonbrener, A. G. (1986). An overview of the medical problems of musicians. *Journal of American College Health*, 34(4), 165-169. doi: 10.1080/07448481.1986.9939631
- Brandfonbrener, A. G. (2009). History of playing-related pain in 330 university freshman music students. *Medical Problems of Performing Artists*, 24(1), 30.
- Brandfonbrener, A., & Kjelland, J. (2002). Music medicine. In Parncutt, R., & McPherson, G.E., (Eds.), *The Science and Psychology of Music Performance*. (pp. 83-98). Oxford University Press.
- Britsch, L. (2005). Investigating performance-related problems of young musicians. *Medical Problems of Perform Artists*, 20(1), 40-47.

- Brooks, P. (1993). Repetitive strain injury. *BMJ: British Medical Journal*, 307(6915), 1298.
doi: 10/1136/bmj.307.6915.1298
- Cooper, S. C., Hamann, D. L., & Frost, R. (2012). The effects of stretching exercises during rehearsals on string students' self-reported perceptions of discomfort. *Update: Applications of Research in Music Education*, 30(2), 71-76.
doi:10/1177/8755123312438720
- Culf, N. (1998). *Musician's injuries: A guide to their understanding and prevention*. Parapress.
- ELDOA Institute. (2016) eldoa-institute.com. Retrieved June 12, 2016.
- Evolutions Institute. (2016) www.evolutionsinstitute.com. Retrieved June 12, 2016.
- Findley, T. W. (2011). Fascia research from a clinician/scientist's perspective. *International Journal of Therapeutic Massage & Bodywork*, 4(4), 1.
- Fishbein, M., Middlestadt, S. E., Ottati, V., Straus, S., & Ellis, A. (1988). Medical problems among ICSOM musicians: Overview of a national survey. *Medical Problems of Performing Artists*, 3(1), p. 1-8.
- Fisbein, M., Middlestadt, S.E. (1989). The prevalence of severe musculoskeletal problems among male and female symphony orchestra players. *Medical Problems of Performing Artists*, 4(1), p. 41-48.
- Fotiadis, D. G., Fotiadou, E. G., Kokaridas, D. G., & Mylonas, A. C. (2013). Prevalence of musculoskeletal disorders in professional symphony orchestra musicians in Greece: A pilot study concerning age, gender, and instrument-specific results. *Medical Problems of Performing Artists*, 28(2), 91-95.

- Franco, G. (2011). Health disorders and ergonomic concerns from the use of the microscope: a voice from the past. *American Journal of Clinical Pathology*, 135(1), 170-171. doi: 10.1309/AJCPUYF00YHFHJ
- Fry, H. J. (1987). Prevalence of overuse (injury) syndrome in Australian music schools. *British Journal of Industrial Medicine*, 44(1), 35-40. doi:10.1136/oem.44.1.35
- functionalpatterns. (2014, November 20) *Thomas Myers- Fascia 101*. [Video file]. Retrieved from <https://www.youtube.com/watch?v=-uzQMn87Hg0>
- Graffman, G. (1986). Doctor, Can Yom Lend an Ear?. *Medical Problems of Performing Artists: Performer's Perspective*. pp. 4-6.
- Guptill, C., & Zaza, C. (2010). Injury prevention: what music teachers can do. *Music Educators Journal*, 28-34. doi:10/11770027432110370736
- Hammer, W. (2000). Integrative fascial release & functional testing: Commentary. *Australasian Chiropractic & Osteopathy*, 9(1), 13.
- Heinan, M. (2008). A review of the unique injuries sustained by musician. *Journal of the American Academy of Physician Assistants*, 21(4), 45-52. doi:10.1097/01720610200804000-00015
- Horvath, J. (2010). *Playing (less) hurt: an injury prevention guide for musicians*. Hal Leonard Corporation.
- SomaTrainingUK. (2014, Sep 21). *Guy Voyer talks about his SomaTraining program- Part 1*. [Video File]. Retrieved from <https://www.youtube.com/watch?v=RefIZxN8AAs>
- Wellcast. (Dec 3, 2012). Are You Aging or Just Drying Out? –Tom Myers. [Video File]. Retrieved from <https://www.youtube.com/watch?v=wL1ZVarr1R8Wel>.

Kerr, Alexander. Personal Communication, February 23, 2015.

Kerr, J. 2012. *Website: Musicians Are Athletes. Blog- EDOA*. Retrieved from

<http://www.musiciansareathletes.com/2013/09/20/eldoa/>)

Kuorinka, I., Jonsson, B., Kilbom, A., Vinterberg, H., Biering-Sørensen, F., Andersson, G., & Jørgensen, K. (1987). Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. *Applied ergonomics*, 18(3), 233-237. doi: 10.1016/0003-6870(87)90010-X

Kreutz, G., Ginsborg, J., & Williamon, A. (2009). Health-promoting behaviours in conservatoire students. *Psychology of Music*, 37(1), 47-60.
doi:10.1177/0305735607086047

Lahme, A., Eibl, I., & Reichl, F. X. (2014). Typical musculoskeletal patterns in upper string players with neck and arm problems. *Medical Problems of Performing Artists*, 29(4), 241.

Lederman, R. J. (1993). Entrapment neuropathies in instrumental musicians. *Medical Problems of Performing Artists*, 8, 35-35.

Manchester, R. A. (2009). Looking at musicians' health through the "ages". *Medical Problems of Performing Artists*, 24(2), 55-58.

Manchester, R. A. (2010). Fatigue, performance, and overtraining. *Medical Problems of Performing Artists*, 25(2), 47.

Manchester, R. A. (2010). Professional education in performing arts medicine. *Medical Problems of Performing Artists*, 25, 139-140.

Manchester, R. A. (2012). The Role of Rest. *Medical Problems of Performing Artists*, 27(3), 121.

- Manchester, R. A., & Flieder, D. (1991). Further observations on the epidemiology of hand injuries in music students. *Medical Problems of Performing Artists*, 6(1), 11-14.
- Norris, R. & Torch, D (Ed.) (January 1, 1993). *The Musician's Survival Manual*. Retrieved May 4, 2014, from http://musiciansurvivalmanual.com/Exercise_for_Musicians.html.
- “Medical problems of performing artists.” (n.d.) *Medical Problems of Performing Artists*. Retrieved from <http://www.sciandmed.com/mppa/>
- Müller, D. G., & Schleip, R. (2012). Fascial Fitness. *Fascia: The Tensional Network of the Human Body*. Elsevier.
- Murer, B. Personal Communication, February 22, 2015
- NINDS Repetitive Motion Disorders Information Page. (n.d.). Retrieved May 17, 2015 from http://www.ninds.nih.gov/disorders/repetitive_motion/repetitive_motion.htm
- Nordin, M., & Frankel, V. H. (Eds.). (2001). *Basic biomechanics of the musculoskeletal system*. Lippincott Williams & Wilkins.
- Paarup, H. M., Baelum, J., Holm, J. W., Manniche, C., & Wedderkopp, N. (2011). Prevalence and consequences of musculoskeletal symptoms in symphony orchestra musicians vary by gender: a cross-sectional study. *BMC Musculoskeletal Disorders*, 12(1), 1. doi: 10.1186/1471-2474-12-223
- Palac, J. (2012) Forum: Musical wellness: Opportunities for string researchers. *String Research Journal*, 3(5). doi: 10.1177/002743210080940035
- Palac, J. (2012). Forum: Musical Wellness: Opportunities for String Researchers. *String Research Journal*, 3, 5.

- Paull, B., & Harrison, C. (1999). *The athletic musician: a guide to playing without pain*. Scarecrow Press.
- Quarrier, N. F. (1993). Performing arts medicine: the musical athlete. *Journal of Orthopaedic & Sports Physical Therapy*, 17(2), 90-95. doi: 10.2519/jospt.1993.17.2.90
- Quarrier, N. F. (2013). Musicians are Athletes Too. *Journal of Yoga & Physical Therapy* 3(3). Doi: 10.4172/2157-7595.1000141
- Ramazzini, B. (2001). Bernardino Ramazzini: The father of occupational medicine. *American Journal of Public Health*, 91(9), 1380-1382. doi: 10.2105/AJPH.91.9.1382
- Ranelli, S., Straker, L., & Smith, A. (2008). Prevalence of playing-related musculoskeletal symptoms and disorders in children learning instrumental music. *Medical Problems of Performing Artists*, 23(4), 178.
- RehabWebinars's Channel. (2013, January 4). *Tom Myers Anatomy Trains in Rehabilitation and Fitness* [Video file]. Retrieved from <https://www.youtube.com/watch?v=CpKooVJlI8M>
- Rickert, D. L., Barrett, M. S., & Ackermann, B. (2013). Injury and the orchestral environment: Part I. *Medical Problems of Performing Artists*, 28, 219-229.
- Rietveld, S., Van Beest, I., & Kamphuis, J. H. (2007). Stress-induced muscle effort as a cause of repetitive strain injury?. *Ergonomics*, 50(12), 2049-2058. doi: 10.1080/00140130701393403
- Russell, J. A. (2006). The influence of warm-ups and other factors on the perceived physical discomfort of middle school string students. *Contributions to Music Education*, 89-109.

- Russell, J. A., & Benedetto, R. L. (2014). Perceived Musculoskeletal Discomfort Among Elementary, Middle, and High School String Players. *Journal of Research in Music Education*, 62(3), 259-276. doi: 10.1177/0022429414543307
- Schleip, R., & Müller, D. G. (2013). Training principles for fascial connective tissues: Scientific foundation and suggested practical applications. *Journal of Bodywork and Movement Therapies*, 17(1), 103-115. doi: 10.1016/j.jbmt.2012.06.007
- Schultz, R. L., & Feitis, R. (2013). *The endless web: fascial anatomy and physical reality*. North Atlantic Books.
- SomaTraining - Level 2 Certificate of Advanced Trainer. (n.d.). Retrieved May 17, 2015, from http://www.guyvoyer.com/eng/somatraining_niveau2.htm#).
- Teachout, T. (2011). Commentary: Leon Fleisher Returns-Again: Looking back at the career of a truly great artist of our age. Retrieved from <https://www.commentarymagazine.com/articles/leon-fleisher-returns-again/>
- Toledo, S. D., Nadler, S. F., Norris, R. N., Akuthota, V., Drake, D. F., & Chou, L. H. (2004). Sports and performing arts medicine. 5. Issues relating to musicians. *Archives of physical medicine and rehabilitation*, 85, 72-74.
- Trollinger, V. (2005). Performing Arts Medicine and Music Education: What Do We Really Need to Know?. *Music Educators Journal*, 92(2), 42-48. doi: 10.2307/3400196
- Voyer, G. (2003). Les ELDOA.
- Watson, A. H. (2009). *The biology of musical performance and performance-related Injury*. (pp. 213-231). Lanham, MD: Scarecrow Press.
- Wellcast. (2012, December 3) *Are You Aging or Just Drying Out? – Tom Myers*. [Video file]. Retrieved from <https://www.youtube.com/watch?v=wL1ZVarr1R8>.

- Williamon, A., & Thompson, S. (2006). Awareness and incidence of health problems among conservatoire students. *Psychology of Music*, 34(4), 411-430.
doi: 10.1177/0305735606067150
- Winberg, J. S., & Salus, M. F. (1990). *Stretching for strings*. Tichenor Pub.
- Zaza, C., Charles, C., & Muszynski, A. (1998). The meaning of playing-related musculoskeletal disorders to classical musicians. *Social Science & Medicine*, 47(12), 2013-2023. doi: 10.1016/S0277-9536(98)00307-4
- Zetterberg, C., Backlund, H., Karlsson, J., Werner, H., & Olsson, L. (1998). Musculoskeletal problems among male and female music students. *Medical Problems of Performing Artists*, 13, 160-166.

Appendix A: Participation Email

Dear (Instructor Name),

My name is Anna Clement, and I am a Master in Music Education student and study violin with Dr. Brenda Brenner. I am designing a study to investigate the effects of ELDOA on violinists that participate in the JSOM Orchestras. ELDOA, (Etirements Longitudinaux avec Decoaptation Osteo-Articulaire), is a series of exercises designed to improve and maintain good posture and spinal health developed by renowned French osteopath Guy Voyer, D.O. ELDOA are precise exercises that place the fascia, muscles, tendons and ligaments of a vertebral pair or joint in the exact position to open/de-coapt the specific spinal or joint segments. The sessions are held every Tuesday and Thursday at 6:15 in the MAC Green Room and led by Jona Kerr. Currently, I am in need of student participants, especially those students who have battled with repetitive stress or overuse injuries, or have mentioned that they play with tension or pain. If you have any students that fit into this category, please pass along my contact information. This study will hopefully benefit all students, but will most benefit those who have existing physical pain from playing their violin.

Thank you!

Sincerely,
Anna Clement
annlclem@indiana.edu

Appendix B: IRB Form

IRB STUDY #1407485061

INDIANA UNIVERSITY INFORMED CONSENT FORM FOR

Repetitive Stress Injuries and the Effects of ELDOA on Indiana University Violinists

You are invited to participate in a research study of the effects of ELDOA on the physical health of Indiana University violinists. You were selected as a possible subject because **you are a violin student at the Jacobs School of Music and practice multiple hours each day. This study will require you to attend Jona Kerr's "Fitness and Wellness Project: ELDOA" sessions on Tuesdays and/or Thursdays at 6:15 for a minimum of 8 sessions. The sessions are free to all JSOM students.** We ask that you read this form and ask any questions you may have before agreeing to be in the study.

The study is being conducted by Anna Clement/ Music Education Department/Jacobs School of Music.

STUDY PURPOSE

The purpose of this study is to study the effects of ELDOA on violinists at Indiana University and to determine if stretching will reduce pain, relieve past injuries, and strengthen muscles to help prevent future injuries.

NUMBER OF PEOPLE TAKING PART IN THE STUDY:

If you agree to participate, you will be one of about 15 participants.

PROCEDURES FOR THE STUDY:

If you agree to be in the study, you will do the following things:

- 1) **Receive an online survey linked to you via your Indiana University email address. The survey must be filled out within 2 days of receiving it.**
- 2) **Sign up for the 8-10 ELDOA sessions with Jona Kerr by going to <http://www.signupgenius.com/go/jsfm>**
- 3) **Attend 8-10 free sessions of ELDOA with Jona Kerr before April 1.**
- 4) **After completing the 8-10 ELDOA sessions, contact Anna Clement and you will receive an online post-survey linked to you via your Indiana University email address. You will have one week to fill out the post-survey.**

RISKS OF TAKING PART IN THE STUDY:

ELDOA is comprised of risk-free stretching, and therefore you are not taking any risks.

BENEFITS OF TAKING PART IN THE STUDY:

It is reported by Guy Voyer, researcher in developing the ELDOA method, that these specially designed stretches could create space within the joints, improve blood flow, reduce pressure on

the inter-vertebral joints of the spine, increase muscle tone and awareness, and reduce overall physical pain. These benefits might not apply to all participants.

CONFIDENTIALITY

Efforts will be made to keep your personal information confidential. We cannot guarantee absolute confidentiality. Your personal information may be disclosed if required by law. Your identity will be held in confidence in reports in which the study may be published. Organizations that may inspect and/or copy your research records for quality assurance and data analysis include groups such as the study investigator and his/her research associates, the Indiana University Institutional Review Board or its designees, the study sponsor, , and (as allowed by law) state or federal agencies, specifically the Office for Human Research Protections (OHRP) who may need to access your research records.

PAYMENT

You will not receive payment for taking part in this study.

CONTACTS FOR QUESTIONS OR PROBLEMS

For questions about the study, contact the researcher Anna Clement at annlclem@indiana.edu. For questions about your rights as a research participant or to discuss problems, complaints or concerns about a research study, or to obtain information, or offer input, contact the IU Human Subjects Office at (812) 856-4242 or (800) 696-2949 or by email at irb@iu.edu.

VOLUNTARY NATURE OF STUDY

Taking part in this study is voluntary. You may choose not to take part or may leave the study at any time. Leaving the study will not result in any penalty or loss of benefits to which you are entitled. Your decision whether or not to participate in this study will not affect your current or future relations with Indiana University and the Jacobs School of Music.

Appendix C: Pre-Survey

6/12/2016

Indiana University Violin Students

Indiana University Violin Students

Please fill out this form as honestly and as detailed as possible

* Required

1. First AND Last Name *

.....

2. Indiana University Email Address *

.....

3. Gender *

Mark only one oval.

☐

Male

☐

Female

Education

4. Current Degree Program *

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5. Major(s) *

.....

6. Minor(s)

.....

6/12/2016

Indiana University Violin Students

7. What year of your degree program are you in? *

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.....

.....

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.....

Practicing and Rehearsing Information

8. How many years of private one-on-one instruction have you had on the violin? *

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.....

.....

9. Do you study your instrument privately through the Jacobs School of Music? *

Mark only one oval.

- ☐ YES
- ☐ NO

10. If you answered YES, who do you currently study with?

Mark only one oval.

- ☐ Sigurbjorn Berhardsson
- ☐ Stanley Richie
- ☐ Mark Kaplan
- ☐ I do not take private lessons
- ☐ Brenda Brenner
- ☐ Simin Ganatra
- ☐ Marcio Fuks
- ☐ Grigory Kalinovsky
- ☐ Mimi Zweig
- ☐ Alexander Kerr
- ☐ Kevork Mardirossian
- ☐ Joseph Swensen
- ☐ Jorja Fleezanis

6/12/2016

Indiana University Violin Students

11. Do you participate in one of the JSOM Orchestras? **Mark only one oval.*☐ YES☐ NO**12. If you answered YES, which orchestra are you currently in for the 2015 Spring Semester? ****Mark only one oval.*☐ Chamber Orchestra☐ Baroque/Classical Orchestra☐ Symphony Orchestra☐ Conductor's Orchestra☐ All-Campus Orchestra☐ Concert Orchestra☐ N/A☐ Philharmonic Orchestra☐ University Orchestra**13. How many private lessons do you have per week? ***

.....

14. Length of private lessons in hours and minutes. **Example: 4:03:32 (4 hours, 3 minutes, 32 seconds)***15. On average, how much time do you spend playing your violin in a typical day? ***

.....

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16. On average, how many practice sessions do you have in a typical day? *

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6/12/2016

Indiana University Violin Students

17. On average, how many minutes do you spend, per practice session, on warm-up activities as part of your practicing routine? *

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.....

18. Do you participate in any of the following? *

Select all that may apply.

Check all that apply.

- ☐ Orchestra Rehearsals
- ☐ Ad Hoc Rehearsals
- ☐ Quartet/Small Ensemble
- ☐ None
- ☐ Other:

19. If applicable, how long do you spend per week playing in those groups?

.....

.....

.....

.....

.....

20. How often do you take mental or physical rest when practicing? *

Mark only one oval.

- ☐ Every Few Minutes
- ☐ Once a session
- ☐ Several times per session
- ☐ Never, I play straight through

Instrument Set-up Questions

6/12/2016

Indiana University Violin Students

21. What kind of chin rest do you use? Describe. *

.....

.....

.....

.....

.....

22. How comfortable are you with this chin rest? *

Mark only one oval.

	0	1	2	3	4	5	6	
Not comfortable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely comfortable

23. What kind of shoulder rest, or shoulder supports do you use? Describe. *

.....

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.....

.....

24. How comfortable are you with your shoulder rest? *

Mark only one oval.

	0	1	2	3	4	5	6	
Not comfortable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extremely comfortable

25. Do you feel pain or discomfort in relation to playing your instrument?

Mark only one oval.

- ☐ YES
- ☐ NO
- ☐ SOMETIMES

26. If you answered YES or SOMETIMES, do you tell your private teacher?

.....

General Health

6/12/2016

Indiana University Violin Students

27. Rate your overall health on a scale from 0 to 6 **Mark only one oval.*

	0	1	2	3	4	5	6	
Poor Health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Excellent Health

28. In the past 3-4 weeks, rate any discomfort or pain that you experience WHILE playing the violin **Mark only one oval.*

	0	1	2	3	4	5	6	
No Discomfort	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extreme Discomfort

29. In the past 3-4 weeks, rate any discomfort or pain that you experience AFTER you play the violin **Mark only one oval.*

	0	1	2	3	4	5	6	
No Discomfort	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extreme Discomfort

30. In the past few months have you experienced any pain, weakness, lack of control, aching neck or shoulders, or other symptoms that prohibit you from playing the violin as much as you are normally accustomed? **Mark only one oval.*

☐ YES

☐ NO

31. Within the last few months, have you had to stop playing violin due to discomfort or pain? **Mark only one oval.*

☐ YES

☐ NO

32. Within the last few months, have you had to stop taking lessons due to discomfort or pain? **Mark only one oval.*

☐ YES

☐ NO

6/12/2016

Indiana University Violin Students

33. In the past few months, have you had to stop participating in orchestra rehearsals due to discomfort or pain? *

Mark only one oval.

- ☐ YES
☐ NO

34. In the past few months, have you had recurring physical pain as a direct result of playing your instrument? *

Mark only one oval.

- ☐ YES
☐ NO

35. Have you ever been clinically diagnosed with an injury in direct relation to your instrument? *

If YES, please describe in the "Other" Box.

Mark only one oval.

- ☐ YES
☐ NO
☐ Other:

Discomfort or Pain

36. As a direct result of performing on your instrument, circle to rate the pain and location that you have encountered within the past 3-4 weeks *

Mark only one oval per row.

	0= No Discomfort	1	2	3	4	5	6= Extreme Discomfort
Right Hand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Palm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Fingers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Wrist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Forearm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Elbow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Shoulder	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Neck	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Jaw	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right-Side Upper Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right-Side Middle Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right-Side Lower Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Hip	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6/12/2016

Indiana University Violin Students

37. As a direct result of performing on your instrument, circle to rate the pain and location that you have encountered within the past 3-4 weeks *

Mark only one oval per row.

	0= No Discomfort	1	2	3	4	5	6= Extreme Discomfort
Right Hand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Palm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Fingers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Wrist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Forearm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Elbow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Shoulder	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Neck	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Jaw	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right-Side Upper Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right-Side Middle Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right-Side Lower Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Hip	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

38. As a direct result of performing on your instrument, circle to rate the pain and location that you have encountered within the past 3-4 weeks *

Mark only one oval per row.

	0= No Discomfort	1	2	3	4	5	6= Extreme Discomfort
Left Hand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Palm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Fingers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Wrist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Forearm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Elbow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Shoulder	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Neck	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Jaw	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left-Side Upper Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left-Side Middle Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left-Side Lower Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Hip	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Additional Questions

6/12/2016

Indiana University Violin Students

39. Have you experienced any of the following as a result of playing your instrument? *

Please respond with YES or NO.

Mark only one oval per row.

	YES	NO
Anxiety	<input type="radio"/>	<input type="radio"/>
Depression	<input type="radio"/>	<input type="radio"/>
Sleep Disturbances	<input type="radio"/>	<input type="radio"/>
Stage Fright	<input type="radio"/>	<input type="radio"/>
Performance Anxiety	<input type="radio"/>	<input type="radio"/>
TMJ Syndrome	<input type="radio"/>	<input type="radio"/>

40. When you have issues with discomfort or pain in direct relation to your playing, what have you tried? *

Check all that may apply. If you select OTHER, please explain.

Check all that apply.

- ☐ Over-the-counter medication
- ☐ Prescribed Medication
- ☐ Rest: Stop Playing
- ☐ Application of Ice
- ☐ Application of Heat
- ☐ Splints/Braces
- ☐ No Treatment
- ☐ Surgery
- ☐ Aerobic Exercise
- ☐ Yoga
- ☐ N/A
- ☐ Other:

41. Indicate the following medical practitioners that you have sought out for help. *

Please check the box if those practitioners were successful or unsuccessful

Mark only one oval per row.

	I have not sought help	YES, but UNSUCCESSFUL	YES, SUCCESSFUL	N/A
Massage Therapist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Chiropractor	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Orthopedist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Neurologist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Acupuncture	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Physical Therapist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6/12/2016

Indiana University Violin Students

Exercise

42. How many times per week do you engage in some sort of physical activity lasting **LONGER than 30 minutes?** *

Mark only one oval.

- ☐ I do not engage in physical activity
- ☐ 1 time
- ☐ 2-3 times
- ☐ 4-6 times
- ☐ 5 or more times

43. How long do you engage in physical activity per session? *

Mark only one oval.

- ☐ 30-60 minutes
- ☐ 60-90 minutes
- ☐ 90 or more minutes
- ☐ I do not exercise

44. What kind of physical activity do you engage in the most? *

.....

.....

.....

.....

.....

45. Have you ever participated in Jona Kerr's ELDOA classes at Indiana Univeristy? *

Mark only one oval.

- ☐ YES
- ☐ NO
- ☐ Other:

46. If you answered YES to the previous question: On average, how many times per semester did you attend

.....

.....

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.....

Appendix D: Post-Survey

6/12/2016

ELDOA Class Post-Survey

ELDOA Class Post-Survey

Thank you for participating in my study! Please take your time when answering these questions. They will help me understand the effects of ELDOA on violinists.

* Required

1. First and Last Name *

.....

.....

.....

.....

.....

2. Age *

.....

3. On average, how many hours per week do you spend playing in orchestra? *

.....

.....

.....

.....

.....

4. Do you warm-up physically away from the instrument before playing? *

Mark only one oval.

- ☐ YES
- ☐ NO
- ☐ SOMETIMES

5. If YES, what does that warm-up consist of?

.....

.....

.....

.....

.....

6/12/2016

ELDOA Class Post-Survey

6. Are you consistent with physical warm-ups (away from the violin) each time you practice? *

Mark only one oval.

☐ YES

☐ NO

7. Do you warm up on the violin? *

Mark only one oval.

☐ YES

☐ NO

☐ SOMETIMES

8. If YES, what does your warm-up on the violin consist of?

.....

.....

.....

.....

.....

9. Are you consistent with violin warm-ups each time that you practice? *

Mark only one oval.

☐ YES

☐ NO

10. On average, how much hours do you spend practicing? *

.....

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11. Describe your basic practicing routine in a typical day *

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.....

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.....

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6/12/2016

ELDOA Class Post-Survey

12. How often do you take mental or physical rest when practicing? **Mark only one oval.*

- ☐ Every few minutes
- ☐ Once a session
- ☐ Several times per session
- ☐ Never, I play straight through

13. Have you noticed any changes in your practicing routine since starting ELDOA? *

Please explain if you have. If not, please write "no changes"

.....

.....

.....

.....

14. Have you changed your set- up since starting ELDOA sessions? *

Ex: Have you changed chin rests, shoulder rests, or your physical approach to the instrument.

Mark only one oval.

- ☐ YES
- ☐ NO

15. If YES, explain...

.....

.....

.....

.....

Overall Health and Experiences with Pain or Discomfort**16. Rate your overall health on a scale from 0 to 6 ****Mark only one oval.*

	0	1	2	3	4	5	6	
Poor Health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Excellent Health

6/12/2016

ELDOA Class Post-Survey

17. In the past 2 months, rate any discomfort or pain that you experience **WHILE** playing the violin *

Mark only one oval.

	0	1	2	3	4	5	6	
No discomfort	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extreme discomfort

18. In the past 2 months, rate any discomfort or pain that you experience **AFTER** you playing the violin *

Mark only one oval.

	0	1	2	3	4	5	6	
No discomfort	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Extreme discomfort

19. Since starting ELDOA, have you had to stop playing violin due to sharp pain or discomfort in your body *

Mark only one oval.

- ☐ YES
☐ NO
☐ SOMETIMES

20. Since starting ELDOA, have you had recurring pain as a direct result of your playing? *

Mark only one oval.

- ☐ YES
☐ NO

Locations of Pain or Discomfort

21. Do you feel pain or discomfort in relation to playing your instrument? *

Mark only one oval.

- ☐ YES
☐ NO
☐ SOMETIMES

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ELDOA Class Post-Survey

22. As a direct result of performing on your instrument, click to rate the pain and location that you have encountered since starting ELDOA *

Mark only one oval per row.

	0= No Discomfort	1	2	3	4	5	6= Extreme Discomfort
Right Hand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Palm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Fingers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Wrist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Forearm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Elbow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Shoulder	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Neck	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Jaw	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Side Upper Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Side Middle Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Side Lower Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Right Hip	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

23. As a direct result of performing on your instrument, click to rate the pain and location that you have encountered since starting ELDOA *

Mark only one oval per row.

	0= No Discomfort	1	2	3	4	5	6= Extreme Discomfort
Left Hand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Palm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Fingers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Wrist	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Forearm	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Elbow	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Shoulder	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Neck	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Jaw	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Side Upper Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Side Middle Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Side Lower Back	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Left Hip	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Response to ELDOA

6/12/2016

ELDOA Class Post-Survey

24. Since starting ELDOA, have you noticed any changes in any of the following? **Check all that apply.*

- ☐ Anxiety
- ☐ Depression
- ☐ Sleep Disturbances
- ☐ Stage Fright
- ☐ Performance Anxiety
- ☐ TMJ Syndrome
- ☐ none

25. If you noticed changes in the selections above, please explain *

If there are no changes then state: "no changes"

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26. Did you share your experiences with ELDOA with your private teacher? **Mark only one oval.*

- ☐ YES
- ☐ NO

ELDOA

Please answer these questions as descriptively as possible. The information that you provide in these responses will help me understand the effects of ELDOA.

27. Explain any changes that you have noticed since participating in ELDOA *

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6/12/2016

ELDOA Class Post-Survey

28. How did you feel PHYSICALLY after ELDOA? *

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29. How did you feel MENTALLY after ELDOA? *

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30. How did you feel EMOTIONALLY after ELDOA? *

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31. Did you try anything that you learned in ELDOA on your own? *

Mark only one oval.

- ☐ YES
- ☐ NO

32. If you did practice ELDOA on your own, please describe WHEN and how often.

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33. Did you think about anything you learned in the ELDOA class while practicing on your own? *

Mark only one oval.

- ☐ YES
- ☐ NO

6/12/2016

ELDOA Class Post-Survey

34. If YES, please elaborate.

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35. What is your opinion about ELDOA? *

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36. Would you consider continuing ELDOA classes after the completion of this study? *

Mark only one oval.

- ☐ YES
- ☐ NO

37. Would you recommend the classes to other students? *

Mark only one oval.

- ☐ YES
- ☐ NO

38. Why or why not? *

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39. Has your physical body changed since participating in this study? *

If it has, then explain. If it has not, then write "no changes"

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6/12/2016

ELDOA Class Post-Survey

40. Has participating in ELDOA affected your practicing? *

Please explain. If it has not, then state so in the space below.

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41. Explain your experiences with pain or discomfort since participating in ELDOA *

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42. Since starting ELDOA, have you noticed any changes in your own self-awareness in regards to pain and discomfort? *

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43. Has participating in ELDOA affected your performing? *

If not, then state "no" and explain why.

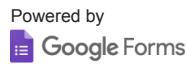
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Appendix E: The main ELDOAs for the class

C4-C5 (Cervical Spine/ Vertebrae 4 and 5)

1. Lie on the back (cubitus) and maintain the chin-in.
2. Feet and knees over the hips with the toes pointed back towards the shins (to create tension). Try to have a right angle with the shins parallel to the ground. Tension creates a fixed point in the lower and upper spine to help de-coaptation occur.
3. Arms above the chest, externally rotate the hands and push to the ceiling and lengthen from the crown of the head.
4. Lift the head ½ inch above the ground and continue to pull the arms up while maintaining the chin-in. This C4-C5 location is the space at the center of the neck, in between the notch (C7) and the line of the jaw (C2).



T6-T7 (Thoracic Spine Vertebrae 6 and 7)

1. Ankles are crossed with a straight spine (making sure it does not lean forwards or backwards)
2. Lengthen through the crown of the head.
3. Palms together on the top of the head and push elbows back in line with the ears while maintaining the chin-in.
4. Knees push down for stability and lengthen through the spine.
5. Begin to gradually lift hands maintaining the elbow and chin until the elbows are as straight as possible and lengthen through the spine.
6. At the top, separate your palms a little bit while keeping knees down and pushing the elbows back, and hands up. This de-coapts the spine in the upper middle of the back, almost where the shoulder blades end at the middle of the spine.



T8-T9 (Thoracic Spine-Vertebrae 8 and 9)

- 1) With knees bent and feet flat on the floor, push the arch of the foot (navicular bone) down to the ground for a fixed point. (Advanced-lift big toes off the ground). The goal is to get the feet as close to the hips as possible while maintaining a tall spine and chin-in.
- 3) Right arm extends out in front with the palm up.
- 4) Left arm extends out in front with the palm up.
- 5) Extend the wrist back and bring the left arm then the right in line to the ears.
- 6) Spread the fingers back with the chin in and with the knees pushing together, reach the arms in the air in line with the ears and push up. This section of the spine rotates and turns when we walk.



L5-S1 (Lumbar 5 and Sacrum 1)

1. End the class with this ELDOA. Use the wall or a partner.
2. Hips close as possible to the wall, sits bones close to the wall with tail bone down, sacrum flat.
3. Rib cage released and chin in, swing legs up the wall maintaining the above.
4. Toes point back towards shins, heels off the wall if possible.
5. Internally rotate the hips, knees, and feet and push the heels to the ceiling while keeping the tailbone flat on the ground.
6. Eyes look down to stretch the duramater of the brain.
7. Arms above the head with wrists spread back and fingers spread wide.
8. Push arms away from the body.

